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New Outlets for Farm Products

Condensed from Marketing Activities

Louis B. Howard

With chemistry as their tool, the Department of Agriculture's four regional research laboratories during their first 5 years of operations have sought out new and wider outlets for American farm products.

One of these laboratories is located in each of the country's major farm producing areas—at Philadelphia, New Orleans, Peoria, and Albany, Calif. The four laboratories, operated by the Department's Bureau of Agricultural and Industrial Chemistry, employ about 1,000 workers—more than half of them chemists, physicists, and other scientists.

The Department had been searching for industrial uses for farm products for 25 or 30 years before these laboratories were set up, but the work was only a side line. But during the late 1920's the chemurgy movement called for an increased industrial utilization of farm crops. The idea caught on among other private groups and some of the State agricultural colleges and other public agencies, but interest was sectional and spotty until the heavy farm surpluses of the early 1930's began to beat down prices. This depression served to unite, expand, and strengthen the chemurgy movement and led to the authorization by Congress in 1938 of the four laboratories and the Federal Government's entry into industrial utilization research on a nation-wide scale.

Fortunately these laboratories were completed and staffed in time to aid in wartime research. More than 150 research projects dealing with the use of agricultural commodities in the war were carried on in these centers. Scientists in the Northern Laboratory, at Peoria, quickly increased the yield of penicillin so it could be produced on a commercial scale. They did this by feeding the mold that produces penicillin a new diet composed largely of two agricultural products—corn steeping liquor, a by-product from the manufacture of corn starch, and lactose or milk

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sugar. About 6 million pounds of milk sugar and 12 million pounds of corn steeping liquor, valued at $1,560,000 and $234,000 respectively, are used annually in the production of penicillin. The value of penicillin produced in 1945 is estimated at more than 100 million dollars, but no money value can be placed on the human lives saved as a result of the large-scale commercial production made possible by the laboratory scientists.

Wartime research in the Southern Laboratory, at New Orleans, showed that better tire cord can be made from cotton by using varieties of cotton selected specifically for this purpose on the basis of their physical properties. Passenger car tires in the popular 6.00-16 size, made from standard and improved cotton cord, ran over 68,000 miles with one recapping at a sustained highway speed of 60 miles an hour—a speed that cuts rubber off tires rapidly. These tests were made by the Army Ordnance Department at its proving grounds at San Antonio, Texas. In the 7.00-20 light truck tire tests, in rear-wheel positions tires made from a selected variety of cotton gave 300 percent more mileage than tires made from regular commercial cotton cord. These tests showed that cotton is adequate for making passenger car tires, and that the mileage of light truck tires is definitely increased when they are made from selected varieties of cotton.

Chemists in the Eastern Laboratory, at Philadelphia, appear to be on the verge of making a hero out of the lowly buckwheat plant. It is being used to produce a drug called rutin, which is extracted from the leaves and blossoms of the green plant. Rutin looks promising for the treatment of sufferers from high blood pressure associated with increased capillary fragility. Clinical tests made thus far indicate that rutin is beneficial in strengthening the weak capillaries. During the last 30 months more than 1,200 cases have been studied at the University of Pennsylvania Medical School and its affiliated hospital. About 20 percent of the patients treated with rutin were suffering from fragile capillaries. Of these patients, 88 percent were restored to normal health through its use.

Rutin is a tasteless, bright-yellow powder that can be taken in tablet form. It is non-poisonous and keeps well under ordinary conditions. The job of the laboratory scientists is to work out practical and economical methods for extracting the drug on a commercial scale. The clinical work is done by medical specialists. During the summer of 1945 about 300 pounds of rutin were extracted from green buckwheat plants by four large drug

manufacturers under the technical guidance of chemical engineers from the Philadelphia laboratory. In 1946 the quantity will be much larger. Since the plant is cut green instead of being allowed to mature, it is possible to get two and sometimes three crops of buckwheat in one season when it is used for rutin. By a rough estimate, it will require about 10,000 pounds of rutin to meet the experimental demand for the drug this year, and more than a million pounds a year to meet medicinal requirements should the present promising results be substantiated and the drug be placed on the open market. This would mean that about 50,000 acres of buckwheat would be needed each year to produce the drug.

Western Laboratory scientists, at Albany, Calif, are trying to find a market for chicken feathers. Like wool, hair, hoofs, and horns, feathers are composed largely of a fibrous protein called keratin. About 175 million lbs. of chicken feathers are wasted each year. Fundamental research looking to the industrial utilization of at least a part of them, in progress in the Western Laboratory for several years, has led to the production on a pilot-plant scale of keratin or chicken feather fiber. The wet strength of the new fiber is still too low for practical purposes, but the chemists hope to solve that problem eventually.

Scientists in the Peoria laboratory are at work on another synthetic fiber called "zein." It is an artificial textile fiber that appears to be suitable for blending with rayon, cotton, and wool for use in knitting yarns and woven fabrics. The finished fibers have a rich creamy appearance. The dry strength of zein equals that of wool, but since its wet strength is only about half its dry strength, more research is needed. Washing with soap solutions does not damage zein. It is probable that the spinning and finishing of the fibers can be made continuous, a decided improvement over the batch method of production. One commercial company is preparing to begin production research on a pilot-plant scale.

Research in the Southern Laboratory has resulted in the production on an experimental scale of a peanut-protein fiber. Called "sarelon," the new fiber has a light cream color and a pleasing softness about midway between that of silk and wool. It takes dyes similar to those used on silk and wool, and shrinks very little in hot water. It resembles wool also in its heat-insulating and moisture-absorbing properties. It may be used alone or mixed with cotton or wool fibers. Its major weakness is its low wet strength.

Before the war, imported hog bristles were used extensively in the manufacture of some of the paint brushes and other brushes used in this country. Bristles imported from China were better than American domestically produced bristles because here hogs are slaughtered at an earlier age than in China. The Eastern Laboratory has developed what appears to be a satisfactory continuous process for producing casein fiber for brush making, and a commercial firm has built a factory to manufacture the product as soon as equipment can be installed.

These synthetic fibers are being developed not to replace cotton, wool, or other natural fibers, but in the hope of making the natural fibers stronger. The scientists hope to improve textile materials by combining the special qualities of the new synthetics with the tried and true qualities of the natural fibers.

At the beginning of the war the Navy was using hominy grits to clean carbon from aircraft engines. But hominy is a food, and food was badly needed as such. In searching for an available nonfood material that could do the same job, the Northern Laboratory developed a soft grit blasting material from corncobs and rice hulls, both of them for the most part farm waste. The mixture is composed of 60 percent of ground corncobs and 40 per cent of whole rice hulls and is used in ordinary airblasting equipment.

The new method has several advantages over the other cleaning methods. It removes carbon, oil and other deposits and gives the metal a clean, dry surface without grinding any of it away. It is about 10 times faster than hand work. As a result of this research, done first on a laboratory scale and later on a pilot plant scale, the soft-grit blasting method is now going into commercial use. One large automobile rebuilding company has adopted it for cleaning pistons, fuel and water pumps, and carburetors. Another company uses it to clean aluminum foundry cores. A glass company uses it to clean its glass molds, and a large oil company uses it to clean paint from the roofs of its huge gasoline storage tanks for the reason that it does not produce sparks.

In the Florida Everglades a large sugar corporation has begun the large-scale production of sweetpotato starch in its new 7-million-dollar plant. This plant, the largest of its kind, was built on the faith the company officials had in the work on sweetpotato starch the Bureau had done over a period of more than 10 years. Scientists in the Southern Laboratory, where the sweetpotato utilization work is done, sup-

plied a great deal of the technical information needed to build and begin to operate the plant. It consumes the annual sweetpotato crop from about 12,000 acres. In addition to from 10 to 13 pounds of starch, a bushel of these potatoes yields about 5 pounds of cattle feed. This feed contains 85 to 90 percent of the feeding value of corn, and it is fed along with other mixtures to the more than 2,000 head of cattle being continuously fattened on the company's property.

Research is also being done to develop a way of producing synthetic liquid motor fuel from so-called farm-waste materials. The process makes possible the chemical conversion of corncobs, sugarcane, bagasse, peanut shells, flax shives, and cottonseed hulls into liquid motor fuels and other commercially valuable products. Results thus far indicate that a ton of corncobs or cottonseed hulls will produce 90 to 95 gallons of liquid motor fuel—about half of it ethyl alcohol. A two-story factory-type building has been built on the grounds of the Northern Laboratory, the equipment is being installed, and the semicommercial plant, when it gets into production about the first of the year, will consume about 6,500 pounds of raw residue material in each 8 hours of operation. Corncobs will be tried first. It is estimated that half of the annual 200 million tons of U. S. farm waste might be utilized in production of motor fuel.

One reason for the program's accomplishments—and those described are merely a few examples—is that a third of the space in each laboratory is used for pilot-plant research. This is research that carries promising results beyond the test-tube stage into semicommercial production, where more comprehensive data may be obtained.

Although the laboratories were established primarily to find *industrial* outlets for farm products, the laboratory searchers attempt to find new *food* outlets also. "Velva Fruit" is one of the results. This new product, which resembles ice cream, can be made from fully ripened fruit. A great deal of ripened fruit is often lost because it is frequently too soft for shipment to fresh-fruit markets.

Research is being conducted in four laboratories on various commodities as follows: Northern—corn, wheat, and other cereal crops; soybeans and other oilseed crops; and agricultural residues such as straws and stalks. Eastern—tobacco; apples; white potatoes; milk products; vegetables; animal fats and oils; and peanuts. Western—fruits; vegetables; white potatoes; wheat; alfalfa; and poultry products and by-products.

St. Joseph Helps the Farmer

Condensed from Nation's Business

Vernon Vine

Two years ago the business men of St. Joseph, Mo., took stock of their situation. They found that those outpost villages that St. Joseph had helped found—Kansas City and Omaha—had made themselves great while their erstwhile sponsor had lagged behind.

It looked as if the citizens of St. Joseph would have to put aside their dreams of grandeur. The town just wasn't going to become the gateway to the West after all, and its citizenry would do well to hitch their wagon to some closer star. While looking for a likely one, they hit on the farming and ranching in the 55 counties of western Missouri and northern Kansas that constitute St. Joseph's trade territory.

A survey of all the town's industries employing 50 or more persons showed that more than half of the employees were directly engaged in handling or processing farm products. A look at the farms and ranches creating these jobs showed that, in the first century or less since the plow originally broke the plains, half the topsoil had gone down the Missouri River. The rest was going at a rate of three per cent a year. Unless something was done soon, St. Joe would have neither star nor wagon.

Today the St. Joseph chamber of Commerce has a $70,000 agricultural projects fund, a full-time professional agricultural agent, and an agricultural program that holds equal rank with the Chamber's industrial program. More than that, it has results to show for what it has done.

Number 1 job was, and is, to stop soil losses. A promising start has been made:

In 1945, 32 farms in Buchanan County started conservation farming. In number, the accomplishments may seem small. Actually most of these farms serve as demonstration projects where the Chamber of Commerce and the county agricultural extension service can show other farm owners the methods and practical benefits of conservation farming.

Conservation farming is not just switching from one crop to another, or plowing on the contour. These are important elements but secondary ones.

On the rolling land around St. Joe, conservation farming begins

Reprinted by permission from Nation's Business, Washington, D. C., June 1946

with a survey of the farm. Next comes a lot of earth moving—the construction of waterways and terraces, the filling-in of gullies, the building of concrete outlet structures for drainage water, the excavation of ponds and erection of dams. The program also calls for spreading lime and commercial fertilizers in large quantities. It calls for spending in some cases $30 to $50 an acre—almost buying the farm all over again.

St. Joseph business men discovered that three things were involved in getting conservation farming started: getting people interested, making earth-moving equipment available, and providing credit to those who needed it.

One of the first jobs Henry Baker tackled when he reported for duty as the Chamber's agricultural agent was to talk up conservation farming. Interest wasn't hard to arouse, but it takes more than talk to move dirt—it takes special equipment, and none was handy.

So his next job was to find a soil conservation contractor who was willing to move to St. Joe and gamble on whether the Chamber of Commerce had created enough interest to make it worth while. The man was found. At the last report, the contractor had work lined up for two years, and estimated that, at the rate requests were coming in, he'd have a lifetime job. Meanwhile, two other contractors have set up in business, and both of them have more work than they can do.

Then St. Joseph banks pledged a $500,000 credit pool to finance soil conservation loans if any project exceeded the lending lists of an individual bank.

Working with Darryl R. Francis, agricultural economist of the St. Louis Federal Reserve Bank; and Webb Embrey, Buchanan County agent; the St. Joseph banks have developed a type of soil conservation loan that Chester Davis, president of the St. Louis Reserve Bank, has called revolutionary.

The loan, which breaks with the past from the beginning, is secured by a deed of trust to the land. Thus the bankers recognize land improvement as a capital investment. Heretofore, practically all such credit has been granted for short terms, usually secured by chattel mortgages.

The limitations of short-term credit in soil conservation work are so great as to make it almost valueless. Few farmers have enough short-term borrowing power to finance both current production expenses and extensive improvements to their land. Moreover, although soil conservation work is self-liquidating, the returns do not come fast

enough to meet short-term loan repayment schedules.

Continuing their precedent breaking, the bankers reasoned that, if soil conservation work improves the land, it adds to the worth of the land, and therefore to its loan value. Just as a loan for remodeling a house can be based on the value of the house after the work is completed, so a loan for conservation work can be based on the value of the land after the work has been done. The loan can be committed safely in advance.

This means that a farmer who is a good moral risk, but who has a minimum of unobligated security, still can borrow for soil conservation work. The repayment schedule for such loans is set up against the increased income to be earned as a result of the conservation work. Using ultra-conservative estimates of increased yields and prewar prices as the basis for their calculations, the bankers believe a farmer can pay back a conservation loan in nine years without ever touching his pre-improvement farm income.

Secretary of Agriculture Clinton P. Anderson said recently, "I was impressed by the pioneer work of the Chamber of Commerce and the bankers of St. Joseph to provide adequate credit, in the proper form, for soil conservation work on farms in their area. I think their plan hit the nail on the head. What has been needed, and what the St. Joseph bankers have provided, is a type of long-term credit geared to the whole conservation job on a farm. BUT conservation farming is just one aspect of the program of balanced farming which the St. Joe Chamber of Commerce is promoting in cooperation with the University of Missouri and Kansas State College.

"Balanced Farming," as Henry Baker describes it, "aims at a living for the farm family, and starts with an inventory of soil resources. It includes a cropping program to fit the soil, livestock to fit the crops, and both to fit the available labor. With balanced farming, instead of having a loss of from two to three per cent of our fertility each year, we hope to get an annual gain of from one-half per cent to two per cent."

But bringing the farming program of an individual farm into balance is a far different job from bringing the farm program of a whole region into balance. Promoting balanced farming is the job of just one committee in the Chamber's agricultural department.

Other committees already have accomplishments that match the beginning made by the balanced farming group. The Dairy Committee, for example, has assisted

in the establishment of an artificial insemination "ring." Twelve hundred cows were serviced the first year ending March 18,1945.

These dairy men have hired a technician, and have contracted with a breeding farm for semen with which to enseminate their cows. Judging by the average production of cows in the territory, the test-tube heifers produced should be enough better than their dams to give $30,000 worth more butter-fat each year.

Another project undertaken in the past year was the refurbishing of a livestock sales pavilion, and the beginning of a series of purebred livestock auctions. This is a double-barreled enterprise, aimed first to win some business for St. Joseph that previously has been going to Kansas City or Omaha and, second, to stimulate interest in better breeding stock on the part of cattlemen in the St. Joe area.

Strange things happen when a program gets rolling. One member of the Agricultural Committee became so enthusiastic that he talked a local industrialist into giving the Missouri Horticultural Society an 80-acre farm just south of St. Joseph. The Society promptly turned the property over to the University of Missouri which is proceeding with studies on the farm—now an experimental station—to find the answers to a number of serious orchard problems in the area.

Another business man, not up to giving away farms, but still wanting to do something special, has volunteered to build a needed barn on the property.

The Research Committee is charged with investigating new developments affecting the production or industrial uses of farm commodities—to make sure that St. Joe misses no bets in the field of chemurgy.

The Rural-Urban relations Committee has such homely, but practical, chores as facilitating the installation of rest rooms, parking areas and other conveniences for use of farm families visiting St. Joe.

Under the Farm Home Improvement Committee comes responsibility for rural electrification, better roads and telephone service.

One of the most ambitious projects is being carried on by the Flood Control Committee which is attempting to induce Army engineers to set up a study of flood control by means of soil conservation.

Frankly skeptical of flood control plans based on taking care of the water after it reaches the streams and rivers, St. Joe business men believe it is worth finding out first if the water can be held back on the farms where it will do some good. For their proj-

ect they have proposed a complete soil conservation program on a watershed drained by one stream—small, but notorious for damaging floods. If they can prove their point, a possible outcome could be a complete recasting of flood control programs for the entire Missouri Valley.

The St. Joseph farm program has won the cooperation of farmers for two reasons. First, it has been offered to them realistically. Second, the Chamber has demonstrated that it can get things done.

"It isn't our purpose to tell the farmers anything," says Walter Parker. "We hope we can demonstrate to them."

The Chamber aims to work in cooperation with local people in each community—the county agricultural agents, the local bankers. The state directors of the agricultural extension service for both Missouri and Kansas are consultants to the Agricultural Committee. In each county where a project is undertaken, the local extension agent also is asked to act as a consultant.

As a result, county agents are referring farmers to the Chamber for jobs that lie beyond the scope of the extension service. When hog raisers were trying to get OPA and War Food Administration to adopt more realistic policies, the Agricultural Policy Committee organized a meeting at which farmers had an opportunity to present their complaints to a U. S. Senator and a Congressman. Performance like that brings in more requests.

St. Joseph is overlooking no promotional efforts in its program, either. For years the town had held an annual 4-H Club livestock show. But with its vitalized agricultural program, the size of the show has been doubled. In 1944, 476 head of baby beeves were exhibited; in 1945, 950 head were entered. Last year's premium list totalled $25,000, and 5,000 persons jammed the auditorium for the main entertainment program.

This activity draws other groups into the agricultural program, too. The women's division of the Chamber sponsors a home economics show and a dinner for farm women. The Junior Chamber of Commerce provides housing and dinner for the boys and puts on the entertainment.

Last year St. Joseph got concrete proof of what the 4-H Club show means businesswise when the Federal Reserve Bank's retail trade figures showed that St. Joseph's business made the sharpest gain for the week recorded in any city in the district.

Other projects sponsored included the establishment of an annual interstate junior dairy show, a Future Farmer's boar and gilt sale, a balanced-farming

dinner to honor farmers "who are making visible progress in applying planned farm management practices."

The Chamber also sponsored a pork production contest, a horticultural show, a lamb and wool school, and a feed dealers' conference. Attendance exceeded 15,000 at a recent farm machinery and home equipment show.

The Agricultural Projects Committee of the St. Joseph Chamber of Commerce is composed of 20 men. At the top are the agricultural vice president, as chairman; two associate chairmen; a director of the Chamber; and the Chamber's agricultural agent. Other members are the 16 chairmen of the individual project committees (one of whom is the representative of the Chamber's board of directors).

Where they were available, farmer-members of the Chamber have been appointed to the projects committee. Membership on the subcommittees generally includes one or more farmers, most of whom are not even members of the Chamber of Commerce.

The $70,000 agricultural projects fund is administered by a separate board of five trustees, two of whom are farmers, and one of these is not a Chamber member.

The fund is not an endowment. It was raised to be spent. The present annual budget of the Agricultural Projects Committee is about $14,000, not including expenditures for special events. It seems little enough to spend when the possible returns are so large.

The greatness of a people is no more affected by the number of its inhabitants than the greatness of an individual is measured by his height. Whoever presents a great example is great.

—*Victor Hugo*

Increasing Pork by Decreasing Loss

Condensed from Hog Breeder

C. P. Thompson

Oklahoma A. & M. College

A FEW years ago the United States Department of Agriculture in conjunction with several of the experiment stations made an exhaustive survey of pig losses in the hog belt. They found, upon analyzing the date, that between 30 and 35 per cent of all pigs farrowed died before they were two months of age. A large percentage of these were lost during the first few days after farrowing. Compared to this, there was a loss of only 10 per cent of the entire crop of pigs farrowed from diseases of all kinds after the pigs are weaned. The following chart published by the United States Department of Agriculture gives a summary of the various causes of loss of pigs between farrowing and weaning time:

A study of this chart will reveal the startling fact that most of this loss can be prevented by proper management. By far the largest loss is from pigs being overlaid by their mothers. To prevent loss of pigs from this cause, farrowing houses should be ample in size—7 x 7 should be considered the extreme minimum and a farrowing pen 8 feet quare is none too large.

Causes of Death	Av. % Farrowed
Overlaid	15.0
Born Dead	5.2
Chilled	3.0
Born Weak	2.2
Starved	1.5
Eaten by Sow	1.1
Scours	0.5
Sore Mouth	0.3
Thumps and Worms	0.3
Injured by Other Stock	0.3
Lost	0.1
Smothered	0.1
Miscellaneous	4.8
Total	34.4

The second cause is rough uneven floors, especially where dirt floors have been rooted up by the sow and allowed to remain low in the center and perhaps higher around the edges. Drafts cause sows to be fretful and uneasy and a house that has open cracks, especially on the north, east, or west, is bound to contribute to the loss of pigs at farrowing time.

Most people are conscious of the importance of guard rails in

Reprinted by permission from the Hog Breeder, Chicago, Illinois

a farrowing pen, but in far too many cases, the guard rails are too close to the ground and not far enough from the walls. It is not necessary, as a rule, to have guard rails around the entire farrowing pen, but in the corner of the pen farthest from the door or doors a guard rail, not less than 12 inches from the floor and anywhere from 12 to 18 inches from the wall, should be provided. This gives ample room for the pigs to get back out of the way and still provide plenty of bedding.

Too much bedding at farrowing time does more harm than good. The only bedding necessary or desirable when a litter is farrowed is chaff or fine straw enough to keep the floor dry. More bedding may be added after the pigs become older.

It is the opinion of those who have used pig brooders that they are one of the best methods yet developed for saving pigs. Pig brooders need not be expensive. They can be built by any hog man and are extremely practical where electricity is available. Care should be taken, however, in wiring the hog house for a pig brooder and in fixing the brooder in such a way that the sow cannot get to it. Recently a valuable sow and 12 pigs together with the hog barn were completely destroyed when a poorly constructed brooder was used and the wiring was not safe. An ordinary light bulb and cheap reflector are satisfactory for the pig brooder.

A good many of our most successful hog men make a practice of taking the pigs away from the sow as fast as they are farrowed, keeping them in a box until all pigs have been farrowed, allowing them to dry, and then placing them back with the sow. This is a very commendable practice and where pig brooders are used, the brooder can be used as a holding place for the pigs instead of a box. A large percentage of the pigs laid on by the sow are lost during the process of farrowing. A sow that is very restless and clumsy while she is farrowing a litter is usually very quiet for hours after the litter is farrowed. When pigs are kept in a box, have plenty of bedding in the box and put a gunny sack loosely over the top. One man of my acquaintance smothered an entire litter by putting them in a tight box and placing a horse blanket over the box.

There is always the question of whether or not the small tusks should be clipped from pigs at forrowing time. If it is a large litter and the pigs persist in fighting and cutting each other, it is a good plan to cut these teeth, but extreme care should be taken not to injure the gums or "Bull nose" may be the result.

Every man who has ever raised

pigs has learned some time from experience that when a sow is over-fed immediately following farrowing, the entire litter is apt to develop a severe case of scours and may even die. One of the best rules to go by in caring for a sow after she has farrowed is not to give her anything but water for anywhere from 24 to 48 hours. After this, put her back on feed very gradually so that she will not produce more milk than the pigs are able to consume.

Anemia, which is caused by an insufficient amount of hemoglobin in the blood and manifests itself in the form of thumps and scours, can be prevented by keeping fresh clean dirt in the farrowing pen. When the pigs are only a few days old, they will be found rooting in the dirt and eating. There is a sufficient amount of iron in most dirt to prevent anemia. Be sure that the dirt is clean, taken preferably from some place where hogs have not been kept, and that the dirt is completely stirred up and fresh so that the pigs will be able to root in it.

The feeding of orphaned pigs successfully is both an art and a science. Two mistakes are commonly made. First—most people attempt to dilute cow's milk for pigs when, as a matter of fact, sow's milk contains 40 per cent more total solids than cow's milk. Sow's milk is richer in butterfat, protein, and ash. Use fresh cow's milk for orphaned pigs, adding a tablespoonful of lime water, made by dissolving any form of lime in water and allowing the undissolved part to settle to the bottom, to a pint of milk. This is not for the purpose of diluting the milk, but for the purpose of helping correct digestive disturbances. Keep in mind that the average pig does not consume more than one pint of milk daily for the first week or 10 days of its life and limit each pig to this amount or less; feeding every two or three hours during the day and at least once during the night for the first week. After which, the amount of milk can be increased as the pig is able to take more milk without becoming scoured.

Blight Threatens Entire Tomato Industry

Condensed from American Agriculturist

Robert H. Rumler

THE tomato growing season is over! But the tragedy of an estimated $40,000,000 loss by tomato growers during the past season will long be remembered. Last year, for the first time, commercial production of tomatoes in practically all of the important tomato growing areas east of the Mississippi River was seriously affected by "blight," as it has been commonly termed by tomato growers. It ravished and in many instances completely destroyed tomato crops from Florida to New England and from the Atlantic Coast to the Mississippi River.

As a result of "blight," many commercial tomato growers, farm planning experts, as well as commercial canners, are wondering just what the future of their industry may be. They are wondering if this disease is going to alter their present plan of southern plant production for early transplanting in northern fields. They are also wondering if the tomato industry may now be at the same place in agricultural history as the potato industry found itself some fifteen or twenty years ago. At that time potato growers were forced to change to a more highly specialized and commercialized type of production because of this same blight. These questions and many others have been brought rapidly to a head this year by the late blight disease.

Although plant pathologists generally agree that the "blight" fungus which affected tomatoes has long been known as the same fungus which causes late blight on potatoes, its exact identity remains questionable in the minds of some. Technically the late blight organism is known as *Phytophthora infestans.*

On tomato leaves, "blight" first appears as irregular, blackish-green, water-soaked spots. These spots enlarge rapidly and in moist weather a downy growth of fungus may appear around the infected area. On the tomato fruit itself the "blight" attacks fruit in all phases of growth. The first symptoms are gray-brown water-soaked areas which may enlarge and cover half or more of the tomato. Then, as the fruit becomes older, the spots take on a green, blotched-with-brown appearance.

The surface of the tomato itself is firm, but has a wrinkled or corrugated appearance. As the

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fruit ripens, the area becomes dark green and separated from the healthy red tissues by a green border. It takes about five days for the infection of the tomato fruit to take on the above symptoms.

This fungus is not known to live from year to year on the tomato seed, dead plant parts, or in the soil. Some pathologists believe that the explanation for the wide-spread occurrence of late blight this year lies in the possible introduction of a new strain of the fungus, which may be more tolerant to high temperatures. With air-borne sporangia, this disease could very easily sweep the country if weather conditions were favorable. This apparently is exactly what happened with late blight on tomatoes this year.

For those who have been interested in plant disease problems, it has been extremely interestinig, although not very pleasant, to watch the development of the tomato "blight" disease during the spring and summer of 1946. Actually the "blight" started in Florida in the early Fall of 1945, when it was first reported in southern Dade County.

Of course, no one is willing to say that the disease which started in Florida and other southern tomato areas was actually the cause of the entire eastern infection of this disease. However, the appearance of the disease in southern areas, plus extremely favorable weather conditions throughout the entire growing season, is believed to be responsible for the millions of dollars which were lost by the tomato industry this year as a result of "blight."

The situation regarding tomato "blight" in Florida is indicative of the extreme care which must be exercised in order to control diseases, particularly when weather is favorable for the development of disease in epidemic proportions.

In the fall of 1945, there was no frost in either of the two areas in which the "blight" was reported in Florida. Had there been a frost, the old crop of vines would have been killed and with them the disease might also have been eliminated.

However, with the establishment of tomato seedbeds in the immediate vicinity of the affected areas, the opportunity for infection on the fall plants as soon as they emerged from the soil was ideal. This resulted in a total loss of the crop in some areas and a considerable reduction of the crop in others.

Then, too, the disease spread progressively to field planting and appeared in most all home gardens throughout the state. The problem was further complicated by the fact that some home gardeners and many commercial

growers were unprepared to spray or dust to check the disease or to prevent infection.

In Georgia the tomato blight situation was much like Florida.. Some transplants were brought from the tomato growing areas of Florida and Georgia for early setting for the green-wrap market. Some of these plants set in the Georgia fields were the first to mature. Ten to ninety per cent of the fruit on these plants showed "blight" spots.

As a result of the spots showing up on green-wrap tomatoes, buyers left the market and prices dropped to around $1.00 to $1.50 —less than half the opening price on the market this year. It has been estimated in Georgia that a loss of at least one half of the crop was realized by tomato growers. In addition these growers received less than half of the average price of last year's tomatoes for that portion of their crop which they were able to market.

Reports from Maryland indicate that late blight losses were the most severe suffered by tomato growers in the past twenty-five years. As early as the middle of August, 1946 Maryland pathologists were estimating their losses at approximately 45 per cent. With continued favorable weather for the development of the disease, this loss mounted steadily throughout the picking season. The $10,000,000 tomato industry in Maryland, Delaware, Pennsylvania and New Jersey, as well as the great cannery areas of New York State, suffered equally with the industry in other areas.

The impact of the tomato blight upon processing companies has been just as great as upon growers. Officials of one large processing company indicated that they had "never seen anything to equal the ravishes of the current blight which is sweeping across practically all the Eastern States." In their statement this company pictured entire fields of tomatoes as virtually disappearing from Monday to Friday under the destructive forces of this disease. The productioin of acreages under contract with them was reduced from as much as 700,000 bushels to an estimate of 250,000 bushels. This estimate was further reduced by continuous favorable weather for "blight" development.

The problem of tomato blight and the extreme loss caused to growers this year was not a lack of knowledge or how the disease could be controlled, nor was it a lack of materials for the control of the disease. On the contrary, the basic problem was the lack of a plan for the control of a disease which previously had not been of economic importance to the industry. In demonstrations conducted by extension and research personnel of the agricultural col-

leges, it was conclusively shown that late blight on tomatoes could be controlled successfully with the application of sprays or dusts.

A number of growers reduced their tomato blight losses to a negligible figure by keeping their plants covered with protective fungicides such as "fixed coppers," or with bordeaux mixture which proved effective but is much more injurious to tomato plants.

Tests in Pennsylvania showed practically no disease in tomatoes which had been sprayed with fixed or insoluble copper such as Copper A, but almost a complete loss of tomatoes in adjoining rows which had not been sprayed.

In New Jersey the first three pickings from 100 unsprayed plants showed over 2,600 green and ripe fruits destroyed by late blight, while only 12 diseased fruits were found on an equal number of plants sprayed with insoluble copper fungicides. Early reports from this demonstration in New Jersey indicated that the sprayed areas produced twice as much marketable fruit as the unsprayed areas, with many healthy fruits remaining for later picking.

As early as mid-August Dr. W. T. Schroeder, plant disease specialist of the Geneva Experiment Station, was calling on New York growers to use copper sprays and dusts to prevent loss. He recommended that dusts made by combining 14 pounds of "fixed copper" with 86 pounds of talc or pyrax be applied at the rate of 40 to 60 pounds per acre. For those growers having facilities to apply sprays, his recommendations called for 4 pounds of "fixed copper" (about 50% copper) per 100 gallons of water applied at 200 gallons per acre with 4-2-50 bordeaux as another possible spray mixture. These recommendations parallel those which potato growers have found effective as regular applications for the control of late blight on potatoes.

The big question which now faces commercial tomato growers, canners, and others directly connected with the industry is the approach that should be taken to tomato production in 1947. Will the prevalence of late blight on tomatoes mean that plant production will have to be cared for in the immediate vicinity where the final crop is grown? Will plant growers in the southern areas be willing and able to change their management plans in order to control disease outbreaks before transplants are pulled for shipment north?

So far as the commercial growers in the North are concerned, it is now quite obvious that a complete spraying or dusting program will be necessary in order to insure the crop against similar outbreaks of "blight" and other

diseases, and insects during the years to come.

Regardless of what changes are made in the tomato growing industry to meet this situation, it is certainly a most obvious fact that the industry will be neither willing nor able to suffer losses comparable to those of 1946.

Better Hatching Eggs

Condensed from Poultry Tribune

Joe W. Sicer
Extension Poultryman Purdue University

A $1,000 BOND! That is what one Indiana flock owner was able to buy with the accumulated premiums he received for producing eggs that gave extra good hatches. Pretty good pay for the extra attention and study needed to make his flock of 700 hens earn the top premiums because of high hatchability!

That is the kind of flock from which a hatchery will keep on buying eggs at the tail end of the season, long after it has dropped off the poorer hatching flocks.

Good hatcherymen fully appreciate that a boost of just 5 per cent in their average hatch for the season can mean the difference between just a reasonably good year and a very profitable year. Take a hatchery with a capacity of 50,000 eggs for example. If it can increase its average hatch for the season from 70 per cent up to 75 per cent, and if during the year it hatches only three chicks per egg capacity, and sells the chicks at 12 cents each, it will increase its income by $900. Most of this increase will be clear profit.

Good hatching eggs don't "just happen." The care and management that gives good egg production will not always give good hatching eggs. But the feeding and practices which give the utmost in hatches will also result in top egg production.

The production of good hatching eggs is dependent primarily upon four factors:

1. Good breeding stock.
2. Good feeding.
3. Good care and management of the flock.
4. Good care of the eggs produced.

The ability of an egg to hatch is an inherited characteristic. This becomes readily apparent when one has an opportunity to

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study the hatching records of a pedigree breeder. An abundance of good feed and care cannot offset an inheritance of poor hatchability. Improvement in this characteristic must come largely through the work of the specialized breeder, but the flockowner must bear it in mind when ordering replacement stock or bringing in new blood.

Since high quality chicks can come only from high quality parent stock, good breeding is of first importance in a flock producing hatching eggs. The birds in the flock should be selected from the standpoint of early maturity, rapid growth, early feathering, good body development, and health. They should be backed by heritage of egg laying ability, non - broodiness, non - winter pause, good egg size, and other desirable qualities, as well as good hatchability.

The breeding flock needs a complete ration, furnishing energy, good protein, necessary minerals , and vitamins in about the right proportions. Most authorities feel that the vitamin requirements for hatchability are higher than for egg production. Breeder rations should be fed for a considerable period before hatching eggs are to be saved.

Remember that the incubation and hatching of an egg is really just a matter of growth within the shell. Within four days after incubation starts, all the parts of the chick are formed. From then on it merely grows. If the hen has been fed the right kind of a ration she will have been able to "pack the right kind of a lunch" inside that shell so that the chick can come kicking out on the twenty-first day.

Three vitamins are especially important in breeder rations. They are: Vitamin A, Vitamin D, and Vitamin G.

Vitamin A is commonly found in yellow corn, properly cured and handled alfalfa, green pasture, and cod liver oil. At least half of the grain portion of the ration should be yellow corn. The presence of alfalfa meal—preferably leafmeal—in the mash is highly desirable. An additional safeguard against vitamin A deficiency is to keep a rack of good alfalfa hay in front of the birds at all times. The rack can be made from a piece of old wire fencing shaped like a barrel. The most desirable hay would be second or third cutting alfalfa cured in windrows without being rained on, so that it retains a bright green color.

Vitamin D is the sunshine vitamin, also found in cod liver oil and certain other fish oils, and in irradiated products. It takes about twice as much vitamin D for a good breeder ration as it does for a good chick starting ration. Laying house windows that

can be arranged to permit direct sunshine on the birds will supply some vitamin D, but for safety during the winter the vitamin should be supplied through the feed, even when the birds have access to the outdoors.

The vitamin G in the ration can well be supplemented by feeding milk in some form—skimmilk, buttermilk, or condensed buttermilk. As little as a half gallon of skimmilk, or a pound of condensed buttermilk, per 100 hens daily will be a big help. Good alfalfa hay also has some vitamin G.

Watch the mash consumption! Most of the vitamins are in the mash and not the grain. In cold weather especially, the hens are often inclined to eat too high a proportion of grain to mash if given a chance. Using pellets to take the place of part of the grain often assures a sufficiently high consumption of the vitamin-carrying portion of the ration.

Hens that get outside on good green pasture will get all the vitamins they need. One southern Indiana flock had the run of a Ladino clover pasture as soon as it became green in early spring. That flock averaged an 85 per cent hatch for the entire season.

Good Management is a "Must"

It is better to start out with a surplus of males than to have to add more males in the middle of the season. Start with one male to 10 or 12 heavy breed females, and one to 15 to 20 Leghorns. If enough males are lost from a flock so that poor fertility results, replace *all* of the males instead of trying to add additional birds.

Too many males often interfere with each other and poor fertility results. Low partitions in large confined flocks offer opportunities for some seclusion from the other males.

In regions where frozen combs are common, dubbing the males will save much loss from infertility. The dubbing is most easily done on cockerels about 12 weeks old, but may be done at any time. A pair of heavy scissors or tin snips can be used to cut off the combs and wattles. With the young birds nothing need be done to prevent excessive bleeding. Ferric chloride can be swabbed on the cut surfaces of older males as a precaution.

Use a rooster feeder to keep "Dad" well fed. A can will do if tacked high enough on a post so that the roosters can reach the feed but the hens can't. When he finds that the hens don't respond to his gallant calling, he will eat his supper.

Use feeders that do not have the kind of reels or grids which cause the males to injure their combs when eating.

As a general rule, cockerels usually give better hatches than do yearling or older males.

for the hatcheryman when he is traying the eggs. Also, eggs set with the small end down hatch better. Eggs that are not to be held for more than a week need not be turned.

No abnormally shaped eggs, ridged eggs, thin shelled or porous eggs, nor cracked or checked eggs should be included for hatching.

The careful poultryman learns to know the "feel" and "click" of sound eggs.

When you sum it all up though, the best hatches are not going to be obtained unless the caretaker knows his chickens and is right on the job. After all, it is the ability really to see his chickens, not just look at them, that makes it possible for the good poultryman to spot the little things in management which add together to make a real difference in the way eggs hatch.

Finland 4-H Clubs Help the Needy

From Finland comes word that the 4-H Club work started there in 1926 by Frants P. Lund (formerly with the Federal Extension Service), with help from the Rockefeller Foundation and the International Education Board, has been a complete success in that country.

Miss Elizabeth Beaurain of Helsinki, Finland, writes that there are now 100,000 boys and girls in 4-H Club work in their little country, which has a population of 3½ million people. Their production was of great importance during the war and still is.

Miss Beaurain writes: "Since the work was organized by a specialist from U. S. A., it naturally is much like your work. We hold camps and have meetings. . . . In one respect we have perhaps created something new, our work being aimed as much as possible to help the families who have especially suffered from the war, the supporter being killed or an invalid, or the family being evacuated or bombed. The help given such families in the countryside is for a great part given in seeds, manure, compost, wages for workers, rent for the land, or money for buying a domestic animal. We think this is a very good way to help people help themselves."—*Extension Service Review.*

Never overcrowd the breeding flock. Keep the litter deep and dry, and the house well ventilated. Be on the lookout for lice, and don't forget the oyster shell and plenty of clean, fresh water.

Colds in the flock can knock fertility in a hurry. The most successful producers raise their cockerels from baby chicks and so avoid the risk of bringing in colds with mature cockerels.

Above all, no matter how proud you are of your flock, *never* let a visitor inside your chicken house if there is any possibility that he may have been around other chickens. Even the nicest people can carry poultry diseases on their shoes or clothing.

Produce clean eggs. Keep the nests clean and well filled with litter material. Corrugated cardboard on the nest bottom will reduce cracked eggs. Replace soiled litter in the nests promptly.

Control wet litter around the water founts, and have wire netting under the perches so that the birds cannot walk in the manure. If the birds are turned outside, have a gravel "apron" two inches deep for 15 or 20 feet out from the laying house. Keep the birds confined until the noon gathering of eggs. Get rid of the broody hens at once so they cannot break or heat the eggs..

Gather eggs three times or more daily. This reduces the danger of broken eggs, helps keep the eggs clean, and prevents undue exposure to undesirable temperatures. Use a rigid wire basket and do not overfill it.

The greatest lack on many farms is a satisfactory place to store the eggs. A storage room should be humid and cool but not cold. It is generally thought that the temperature probably should be 55 to 60 degrees, although more experimental work is needed to determine the most desirable holding point. Certainly, poor hatches have resulted when the eggs were kept in a basement that registered 55 degrees on a thermometer at eye level but which had a temperature much lower than that down on the floor where the eggs were kept.

A 75 per cent humidity is known to be desirable, the same as for holding market eggs. That is a very moist atmosphere which seldom is obtained unless water is sprinkled freely on the floor and walls. Gunny sack-wicks or other devices also may be used to add moisture to the air. Hot air furnace pipes passing near the eggs almost always draw the moisture out of the eggs.

Soiled eggs should be cleaned with an emery paper brush or steel wool. Eggs should be cooled before casing and should be placed in the cases with the small end down. This is easier on the air cell and is more convenient

Practical Feeding for Milk Production

Condensed from the Guernsey Breeders' Journal

Dr. H. A. Herman

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Feed is the largest single item of expense in milk production. It generally comprises 50 to 55 per cent of the total cost of 100 lbs. of milk. With prices creeping upward, the dairyman can well afford to take stock and realign his sight for practical, economical feeding.

The high producing dairy cow is unexcelled as a producer of human food. The efficiency with which she converts roughages and grains into edible products of unique food value to the human race is well recognized. The food requirements of dairy cattle in order to obtain efficient, economical production, are necessarily somewhat exacting. It is recognized that no herd will produce butter fat with maximum efficiency unless every cow is well-fed and properly managed.

The amount of milk and butter fat produced by a dairy herd depends upon two things. The first is the *inherited ability of the cow.* Natural capacity to produce milk is born in a cow; it cannot be fed into her. To obtain an efficient milk producing herd it is necessary to (1) *follow a sound breeding program* with *constant culling out of the low producers.* The second factor affecting milk production is *feed* and *care.*

The dairy cow uses feed for two purposes, *maintenance* and *production.* Production includes not only milk but *growth* and *development of the unborn calf.* The maintenance of the cow includes rebuilding of worn tissues and supplying materials for maintaining body temperature and muscular activity. *Growth, milk production and development of the unborn* calf can take place only when the ration supplies the necessary nutrient materials *over and above those needed for maintenance.* In other words, scant feeding usually means *"we are just keeping cows."*

To fulfill the needs of the animal body the ration must furnish at least six kinds of food substances, commonly called nutrients. (The term nutrient is applied to any food constituent or substance that aids in the support of life.) These are *proteins, carbohydrates, fats, water, minerals, and vitamins.* Each of these nutrients performs one or more spe-

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cific functions. They vary in the amounts in different feedstuffs and to some extent in the same feeds of a given class. No one feedstuff contains sufficient quantities of these nutrients for needs of the dairy cow. The method of feeding and preparation of the feeds may also affect the nutrient value. In general, the source of protein is not important. The micro-organisms of the ruminant paunch convert nitrogenous products into forms readily obsorbed and meeting the needs of the body.

In addition to the actual nutrient needs, a ration must also meet the following requirements:

A balance of nutrients. Profitable growth and milk production depends upon the essential nutrients being supplied in adequate quantities.

Palatability. This factor is responsible for heavy feed intake so essential for economical and efficient milk production and growth.

Succulence. This characteristic is important in keeping the digestive tract working properly, and aids in palatability and water intake.

Variety. Aids in balancing of nutrients and increases palatability.

Bulk. The cow's stomach is adapted to handling coarse, bulky feeds and the bacterial action of the rumen, and the slow movement of feeds through the tract are all factors in essential use of feed materials usually included in the ration of the cow. No other animal can so efficiently convert coarse fibres into substances suitable for human consumption.

Economy. The successful ration must meet all above outlined requirements and, in addition, be sufficiently low in cost to make its use practical. This latter factor is all too often neglected in some herds.

Roughages provide the basis for all dairy rations. The dairy cow provides a good market for home-grown roughages, and with the emphasis on grassland farming and conservation of soil fertility we should wisely *adapt grain rations to suit the type of roughage available.*

1. *Provide abundant and continuous succulent pasture.* Good pastures stimulate milk flow, lower feed losses and costs, increase efficiency, reduce need of cultivated crops, conserve soil fertility, and reduce labor and machinery costs.
   (a) Improve permanent pastures. Fertilize early once each year—manure is one of the best, or use other fertilizers and lime as per college recommendations. Clip once or preferably twice a year to keep down weeds and conserve surplus growth.

(b) Grow supplementary pasture. Choose crops best fitted to soil fertility level and pasture requirements.

2. *Provide plenty of good hay.* Cut early, cure quickly with minimum leaf loss, and get maximum palatability and digestibility, higher protein and vitamin content. Legume hays usually yield more and are more valuable for milk production. Good hay is worth 60% as much per ton as grain, fair hay 50%.

3. *Provide abundant silage.* Corn, sorghums, legumes, grasses or cereal grains may be used as best meets the local situation. Silage extends the benefits of pasture throughout the winter months or other short pasture periods.

4. *Feed roughage liberally.* It is the principle source of vitamins and minerals and is usually the most economical source of nutrients. Provide 1½ to 2 tons of hay, and about 2½ tons of silage, or if silage is not available, provide 1½ to 2½ tons of hay or other dry roughage annually per cow. Three pounds of silage may replace one pound of hay in the ration.

Since the roughages and pasture available provides the economical program we may proceed to select our grain rations according to this general scheme:

I. Roughage available (1) (non-legume) timothy, orchard grass, straw, corn or sorghum stover, silage, etc. (2) Scant or no pasture.

Grain feed. 24% crude protein (20% digestible crude protein).

II. Roughage (1) (mixed)—alfalfa, soybean, lespedeza, red clover and silage, corn stover, etc. *OR* (2) Fair to good pasture.

III. Roughage (1) All Legumes — alfalfa, soybean, lespedeza, etc.—no silage, or corn stover *OR* (2) Cows on excellent pasture.

It is often impossible to obtain the exact ingredients called for in most formulas for rations, but a wide range of substitute feeds is possible.

Substitutes for corn are: Corn and cob meal, barley, hominy feed, pound for pound. Up to 30% of the corn may be replaced by an equal weight of ground wheat or sorghum grains.

Substitutes for wheat bran are: Oats, alfalfa meal, or wheat middlings, pound for pound.

Substitutes for cottonseed oil meal are: Linseed oil meal, gluten meal, soybean oil meal, crushed soybeans, pound for pound.

There are many commercial mixed feeds on the market under special trade names. Many dairymen must depend upon them as the only source of concentrate feeds. These feeds are usually mixed in such proportions as to

supply a certain minimum percentage of crude protein and other nutrients contained in the feed as a whole, also the separate ingredients used are commonly stated on the bag, the feed tag, and often in the advertising relating to the feeds. Most state laws require a statement of: (1) the net weight of the feed contained in the package, lot or parcel; (2) the name, brand, or trade-mark under which the feed is sold; (3) the name and principal address of the manufacturer or person responsible for placing the feed on the market; (4) the minimum guaranteed percentage of: (a) crude protein, (b) crude fat, (c) the maximum percentage of crude fiber, and (d) the specific name of each ingredient used in the manufacture of the feed.

Many of the commercial mixed feeds contain high grade materials mixed in proportions intended to fit them to be fed with specific combinations of roughages and home-grown grains, and have won good reputations among intelligent feeders. These high grade feeds usually have high palatability, a wide variety of proteins, are well-mixed, and give good results at the pail. Others of these feeds contain low grade materials often carrying enough molasses to make them palatable and are manufactured chiefly "to sell." *Many of the best feeds on the market, however, contain molasses and should not be confused with the low grade mixtures.* A study of the list of ingredients will usually enable the feeder to distinguish between such high and low grade mixed feeds. In general, any feed carrying *over 10% fiber* should be studied carefully, the ingredients noted and considered before purchasing. Some manufacturers use alfalfa meal or beet pulp as a base on which to build their rations, and such feeds may run somewhat higher in fiber, but usually should not exceed 12%, if only high grade ingredients are used.

In considering the purchase of any mixed feeds, it is distinctly to the advantage of the purchaser if he can know:

1. The specific name of each ingredient used in the manufacture of the feed.
2. The exact amount and grade of each ingredient used.
3. The percentage of crude protein and fiber.
4. The percentage of digestible nutrients.

Such knowledge of the kind, amount and grade of each ingredient, the composition and digestible nutrients of the mixed feed enables the feeder to more intelligently study and analyze his feed requirements.

Roughage. Feed all the roughage the cow will clean up. This approximates 2-2½ lbs. hay daily for each 100 lbs. live weight,

or 1-1½ lbs. of hay and 3 lbs. of silage daily for each 100 lbs. of live weight.

More or less silage, hay or other dried roughages may be used as circumstances make desirable by substituting 3 lbs. of silage for 1 lb. of hay, or vice versa. As a matter of fact, either silage or hay can make up the sole roughage, although better results may be expected when both are used except when on pasture.

Grain. (1) Cows on poor or no pasture. Feed Jersey or Guernsey cows 1 lb. of grain daily for each 3-4 lbs. of milk produced; Holsteins, Brown Swiss or Shorthorns, 1 lb. of grain daily for each 4-5 lbs. of milk produced.

(2) Cows on good pasture. Feed Jersey or Guernsey cows 1 lb. of feed daily to each 4-5 lbs. milk produced; Holstein or Shorthorn cows 1 lb. feed daily to each 5-6 lbs. milk produced daily.

For the most profitable results all grains should be medium to slightly coarsely ground.

In feeding either grain or roughage, each cow should be considered individually since each heifer differs in her ability to convert feed into milk. Regulate the amount of feed so that total profits are greatest. The live weight or physical condition of a cow is a good indication of whether she is receiving enough, too much, or too little feed.

As a rule and under good management if a cow is given all of the feed she can convert into milk she will produce at her maximum efficiency and profitableness. Many factors, however, influence efficient milk production. If grain is extremely high in price it is sometimes most economical to feed heavily on roughages and use a minimum amount of grain. If milk prices are high and grain fed is not too far out of line in price, additional amounts of grain may prove a good investment. Above all, each cow must be fed according to her production. All too often the really high producing cow is underfed and the low producer is overfed. Generally, a dairyman must receive about two dollars worth of milk for every dollar he expends in feed to break even on milk production costs. It is often hard to do—cheap feed—pastures and roughages are the answer.

The Bureau of Dairy Industry in Farmers Bulletin 1974 shows the following relation between production and feed costs for cows tested in Dairy Herd Improvement Associations for the year of 1942:

Butter Fat Production Level	Total Feed Cost	Income over Feed Cost
100 lbs.	$ 54	$ 15
200 lbs.	63	57
300 lbs.	74	104
400 lbs.	84	151
500 lbs.	96	197
600 lbs.	108	208

Milk cows require 100 to 300 lbs. of water daily. When their consumption of water is lowered, milk production suffers first. Milk is 85 to 88 per cent water. A cow generally drinks about 4-5 gallons of water per day (depending on succulence in feed) for each gallon of milk she yields. In cold weather either heat the water enough to remove chill or pump just enough to supply the immediate needs of the herd. Don't force the cows to stand exposed to the winter winds while drinking. Build a windbreak. For summer the watering tank should be in a shady place. Salt should also be available in the pasture or exercise lots at all times.

Feeding the Dry Cow

The amount of milk a cow will produce during her lactation depends greatly upon her condition at freshening time. A cow should rest from 6-8 weeks previous to her calving period. Proper feeding during this dry period is just as important or more so than proper feeding during the lactation period. The dry cow builds up her body flesh, mineral reserves, and energy for the forthcoming lactation. The Scotch say "a pound of feed to the dry cow equals two pounds to the fresh cow." She should be provided with good pasture or feed hay and silage at approximately the same rate as to milking cows.

The same grain ration recommended for the milking herd or the dry cow grain mixture suggested below may be fed in such amounts as required to get or keep cows in good condition until about one week before calving. The amount of grain fed will vary from two to eight lbs. per day depending on the condition of the cow. Practices vary greatly with experienced feeders, but all agree that at freshening time a light laxative ration is desirable.

About one week before calving, one-half or more of the grain mixture should be replaced with bran. Beginning about the third day following calving the grain ration may be started then a gradual change back to the regular grain mix. The amount of grain fed may then be increased slowly until the cow is on full feed. Heavy feeding during this period is to be avoided.

A Suggested Grain Ration for Dry Cows

800 lbs. ground oats
600 lbs. ground corn
400 lbs. wheat bran
75 lbs. cottonseed meal
75 lbs. soybean meal
25 lbs. steamed bone meal
25 lbs. salt

Linseed meal may be substituted for a portion of the cottonseed meal and the soybean meal when available at comparable prices.

"Summer slump" generally causes a shortage of milk through

August and September. All too often charged to flies it invariably traces back to short pastures and scant feeding. To prevent summer slump use supplementary pastures, and feed silage, hay and grain to supplement short pastures. Provide plenty of water, salt and shade.

In summary, may attention be called to the fact that in most sections dairying has proved a profitable and pleasant enterprise where the dairymen have provided each producing cow with: 1½-2 tons good legume hay per year; ½ acre small grain, legume, or sudan pasture in addition to native pasture; 3-4 tons of silage in addition to a sufficient amount of a suitable grain mixture; plenty of good water.

Sulfa Drug Promising for Honeybee Ailment

Sulfathiazole is good stuff for bees, too. The drug that has proved so successful in the treatment of certain diseases of humans has given good results in bee colonies for the control of American foulbrood.

Experiments with sulfa for the control of this No. 1 enemy to the bee industry were carried on last year by J. Peter Johnson, entomologist at the Connecticut Agricultural Experiment Station. They confirmed the promising results earlier obtained by researchers at the Missouri Station, who had initiated the work.

Mr. Johnson used eight colonies in the Connecticut experiments. Each was seriously infected with American foulbrood. Sulfathiazole was fed to the bees either dissolved in water or in a combination of sugar and water. The concentrations were always 0.5 gram of sulfa per gallon of liquid. Treatment was begun on June 6 and ended on October 22. The sulfathiazole was available to the bees at all times.

In all cases, decided improvement was noted. The sugar solution was evidently much more palatable to the bees than the plain water solution. All hives given the sulfa-sugar-water combination showed complete elimination of diseased brood in less than one season. While the disease was not checked completely in hives fed the water formula, favorable reaction, to some degree, was shown in every case. The greater success of the formula containing sugar was undoubtedly due to higher consumption by the bees.

Conn. Agri. Experiment Station
Report of Progress.

Latest Roundup on Hormone Feeding

Condensed from the Successful Farming

C. E. Hughes

IT MADE headlines, and there was plenty of talk, when the news about hormone feeding first broke loose. Some remarkable results have been obtained, experimentally, but farmers aren't feeding hormones to their cows, hogs, or chickens. Some of the experiments haven't panned out too well, and many scientists still have their fingers crossed.

Some scientists are more optimistic, although many of them stick to the middle ground. And right on the same fence are officials of many feed companies, and secretaries of several dairy breed associations.

Then what has been holding things up? For one thing, the Food and Drug Administration, which has the public welfare pretty well in mind, wasn't ready to flash the green light. Until just a few weeks ago, F and D had granted permission for sale of only one of these products, thyroprotein (sometimes known as protomone), and then only for stimulating egg production. However, this hormone-carrying substance now can be sold interstate for use on dairy cattle and other livestock.

But F and D still refuses to permit interstate sale of other hormones, or certain products which affect the glands that secrete them. One of these hormones is stilbestrol, which in pellet form has been inserted in the necks of cockerels to improve meat quality. It has a strong tendency to make the males look and behave like females—so F and D wants to make sure that no carryover effect reaches the human consumer.

Then there's that drug, thiouracil. This substance retards action of the thyroid gland (just the reverse of thyroprotein) and makes animals fatten more readily. But, for some reason, it hasn't received the official blessing for commercial use.

But these aren't the only reasons for hesitating to open the floodgates of greater production. Many research workers are yet to be convinced that thyroprotein feeding won't tend to "burn up" cows, shorten length of life, have an adverse effect on breeding efficiency, or injure health. In other words, can birds and animals stand the gaff?

The above are just a few of the questions that are unanswered, or only partially answered. And,

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judging from the way tests have been coming out in various parts of the country, you can blow from hot to cold, depending on the experiment you happen to be checking. This article will present briefly some of the findings to date, and give the reader an idea as to where things stand at the present time.

To keep things straight, we'll first discuss thyroprotein. This product, containing a small percentage of the hormone, thyroxine, has an effect like opening the draft in a stove or furnace. Instead of burning wood or coal, it causes the body to burn up foodstuffs more rapidly, usually stimulating production of milk or eggs. But the draft must not be opened too far.

Let's take a look at some of the results obtained at the Missouri Agricultural Experiment Station.

At Missouri, thyroprotein has made cows give more milk, and the fat test has gone up. In one test using farm cows, 23 out of 27 getting thyroprotein gave more milk, with the increase ranging from 6.6 to 60.8 per cent. The average increase was 18.6 per cent. In one Jersey herd of four, the fat test rose from 5.2 per cent before the start to 6.3 percent after thyroprotein had been fed for about 10 days.

At the New Jersey Agricultural Experiment Station, nine cows received either 10 or 15 grams of thyroprotein daily in their grain ration. Six of the nine cows produced more milk and three gave less during the thyroprotein-feeding period (time ranged from 3 to 17 months) than during a similar part of either an earlier or later lactation.

In an earlier experiment, lasting three weeks, with five cows, the fat content of the milk rose from 3.62 to 4.11 per cent, and the average milk production increased from 23.3 to 25 pounds per day. The cows did not lose much weight as a result of the increased fat production, and the heart rate was stepped up only slightly. The solids-not-fat (skim milk) did not seem to be affected by the hormone.

The research worker who conducted these tests does not believe that every dairy cow should be fed thyroprotein. Good cows won't need it, but any which gain weight at the expense of milk production look like logical candidates. Low testers might benefit from thyroprotein. The herd owner should know his cows and feed the hormone-carrier on an individual basis. You can't treat 'em all alike, because they won't all respond the same.

This New Jersey scientist believes that thyroprotein feeding for, say, 10 consecutive years, might shorten the cow's life. However, he contends that disease eliminates many cows from

the herd before they have outlived their usefulness—therefore, until disease control is improved, it might pay to get all possible milk out of them before they go to the butcher.

In Washington results have not turned out quite so favorably in tests conducted by the dairy division of the United States Department of Agriculture. Thyroprotein was fed at the daily rate of 1 to 1½ grams per 100 pounds of body weight for as long as eight months. The cows gave more milk for a month to six weeks; then they dropped off rapidly until they reached a low of 10 to 15 pounds. Then production leveled off.

The cows began to lose weight before production started to drop. The loss in weight and milk production was checked by giving them 25 per cent more feed, although they were already receiving what is usually considered an adequate ration.

It seems that when the thyroprotein "opened the draft" and burned feed at a more rapid rate, the ration, adequate under normal conditions, simply wasn't enough. The stepped-up body activities, and the added milk production were obtained at the expense of weight, a condition which was remedied by giving 25 per cent more feed. But the question remains as to whether there's any advantage in getting the increased milk production if the feed expense goes up.

For one thing, it is known that a 20 to 25 per cent increase in feed intake will boost milk production 13 to 15 per cent on the average, without need for feeding thyroprotein. Most dairy cows in this country don't get adequate rations anyhow, so what would be the effect if the owners started giving them more thyroprotein without stepping up and improving the rations? What would be the short-time effect, also the long-time pull? Will the old cow be able to live and produce a calf for several years in a row while receiving thyroprotein? Could she stand the heat of summer under thyroprotein stimulation? These are some of the questions being asked by the U. S. D. A.

At the Michigan Agricultural Experiment Station, cows on test maintained a higher level of production both in milk and butterfat than would have been the case without this hormone. Some lost weight and production during hot weather. However, all cows did not respond the same. The cows at Michigan all received more feed than was required for their level of production.

In Louisiana, cows likewise showed increased milk production and a higher butterfat level in one type of test, but these factors actually were lower during the latter part of a second experi-

ment. Furthermore, the cows lost weight, their body temperatures rose, and the pulse rates quickened. Findings to date have led the Louisiana workers to believe that feeding of thyroprotein to dairy cattle is not to be recommended under conditions prevailing in their state.

Cows at the Ohio Agricultural Experiment Station gave more milk when receiving thyroprotein, but, as in some of the experiments conducted elsewhere, more grain was required to do the trick. Body weight dropped, the Vitamon B, content of the milk declined, there was no increase in butterfat percentage, and both the pulse and respiration rates went up. The thyroprotein feeding did not seem to affect markedly the Vitamin A, Vitamin C, or total protein content of the milk. However, a slight decrease was noted in the milk riboflavin and blood Vitamin A.

The Ohio scientists feel that thyroprotein may have a definite place where the thyroid activity of the cow is below normal. A little stimulation through feeding thyroprotein might be a good idea in such instances. But they doubt whether this hormone-carrier should be fed to each and every cow in the herd.

A significant Ohio finding is that the hormone does not pass from the blood into the milk. This result must have been of considerable interest to the Food and Drug Administration, which has had one eye cocked on the effect of milk from hormone-fed cows on human beings.

One scientist, reporting in the *Journal of Endocrinology*, has thrown added light on the effect of iodinated protein (thyroprotein) feeding on milk. For one month, 27 healthy human adults drank one quart daily of milk from cows receiving thyroprotein. No increase in pulse rate, rise in blood pressure, or other ill effects were noted. In fact, some of these people actually gained weight. This indicates that the calories supplied by the milk more than offset any tendency for iodinated protein (if actually present in the milk) to speed body processes.

Thyroprotein tests with 18 cows at the Massachusetts Agricultural Experiment Station revealed a decrease in milk casein but an increase in lactoalbumin and globulin of milk. More variation was found among individuals than between breeds. Wide variations in milk yield were noted, but no consistent change in butterfat.

Based on their own tests and experimental results obtained elsewhere, the feeling at the New York Agricultural Experiment Station is not too optimistic. They recognize that thyroprotein does not make the cow produce

more milk from the same amount of feed. A cow with a normal thyroid gland may give more milk for a while, but a serious weight loss occurs. Her body may work so hard and fast that she will be burned out in a short time. So, these workers agree with some of the others that each cow must be fed individually.

Furthermore, these New York scientists believe that more vitamins and minerals are required as the body processes are stepped up. Finally, if a cow has inherited a sluggish thyroid gland, the feeding of thyroprotein will not prevent passing on this defect to her calves.

Not all of the experimental work with hormone feeding has been done in this country. At the University of Reading in England, the feeding of thyroprotein increased milk production from 16 to 33 per cent, but the research men found that best results were obtained when the stimulation was somewhere near 20 per cent. Very little effect was noted when thyroprotein was fed during the early stage of lactation—none at all at the end. But during the middle stages of lactation the percentage response increased as the lactation period progressed. Here again, extra feed was suggested to offset loss of weight.

Thyroprotein is also being tried to see what can be done for egg production. In Missouri, White Leghorns in their fourth laying year produced 25 per cent more eggs when receiving thyroprotein, than the same-aged birds getting none. Rhode Island Red hens, receiving thyroprotein during their second laying year, produced 33 per cent more eggs than the same-aged birds getting none. One Red hen on thyroprotein, after laying 323 eggs during her pullet year, continued to lay without stopping, producing 282 eggs during her second year.

Leghorn hens on thyroprotein, now in their fifth laying year, showed marked summer maintenance of egg production. By late August, the thyroprotein hens had averaged 90 eggs and those receiving none averaged 53. Death rate has been about the same in both groups. The experimental year closed on October 15.

In a study just completed with two-year-old White Leghorns, the Missouri workers have observed a seasonal decline in the thyroxine secretion rate of 33 per cent from January to July. These scientists believe that such results indicate that less thyroxine is secreted in the hen's body during the latter part of the laying season and that this is one reason why egg production drops off. However, the thyroprotein supplies this needed hormone, so there is a strong tendency to keep production at early-season levels.

No evidence has been obtained

that feeding of thyroprotein causes passage of the hormone into the egg. That is the reason why the Food and Drug Administration had permitted the use of thyroprotein for simulating egg production.

Possible use for thyroprotein may be found for stimulating growth and feathering of young chickens. The thyroid gland is concerned in either case. Research strongly suggests that thyroprotein can keep chicks growing well through the hot summer and stimulate feather growth.

Despite these encouraging results, use of thyroprotein is eyed rather critically by many. Said one college poultry specialist, "It may be like putting an airplane motor in a Model-T Ford." Another poultry expert doubts whether hormone-fed birds would give results better than some production-bred stock.

Turning to another aspect of this many-sided question of hormone feeding, we might review briefly the possibilities of thiouracil. This product has the opposite effect of thyroprotein. Instead of stepping up the body processes and burning more feed, it behaves like the closing of the draft on a furnace. More of the feed is used for storing fat and improving flesh, less for the usual body processes.

When doses of various sizes were fed to 167 broilers at the Indiana Agricultural Experiment Station, growth was retarded slightly, but the market grade was improved. Thiouracil was fed from the 6th to the 14th week. The treated birds made less gain, but they used their feed more efficiently.

At Missouri, the addition of 2/10 of 1 per cent of thiouracil to the diet of broilers for 16 to 36 days made the carcasses grade higher. However, this carcass improvement was obtained at the expense of body weight in the case of the longer treatment.

Research workers at Oklahoma also have experimented with thiouracil for improvement of fleshing of chickens. Apparently, their results have not been quite so promising as those secured at Missouri.

A little experimental work has been done with thiouracil for hogs. At Missouri, several lots of hogs were compared, some receiving thiouracil, others not. The treated hogs were less active, and were shorter and fatter after 28 days than those getting no thiouracil. The treated hogs also gained more rapidly and economically.

The Missouri workers believe that, with proper control, this product could play a role in commercial hog production. However, they realize the possibility that something still more effective might be discovered.

Results with feeding thiouracil in hog rations have been favorable at the New Jersey Agricultural Experiment Station, but these scientists are not ready to release definite data.

Stilbestrol and related products have received more attention so far than thiouracil. These products sometimes are referred to as estrogens, or female hormones. When fed to cockerels or older male chickens, the male characteristics are suppressed and the birds look and behave more like pullets or hens. However, the male characteristics soon return after hormone feeding stops.

At the California Agricultural Experiment Station, encouraging results with stilbestrol have been secured through inserting a pellet of this material under the skin, high up on the neck. This is done about three to five weeks before marketing time. Since much fat is deposited under the skin, the treated birds show an improved finish. Muscle fat also is increased, making the birds more tender and juicy. Much abdominal fat also is deposited. The total weight of the bird is not particularly affected.

Stilbestrol treatment at California has resulted in increased fat deposits in cockerels ranging from 7 weeks to 1 year of age. Meat quality was improved. This was especially true with older males, which normally have stringy, tough, dark meat. Stilbestrol treatment made the flesh paler and more tender.

Attempts have been made to feed stilbestrol through the mouth, rather than implanting the pellet high in the neck. Satisfactory results have not been secured, even when many times the usual amount is fed. However, two related products, dianisylhexene and dianisylhexane, have shown promise in experiments both in California and Oklahoma.

The workers in Oklahoma express hope that dianisylexene can be produced soon in large amounts and at relatively low cost, but again the Federal Food and Drug Administration first must grant permission. Dianisylhexene shows greatest promise for fattening broilers during the last two or three weeks before they are killed. This short feeding period produces the greatest effects using the least amount of hormone.

The smooth velvety skin makes the broilers look like capons, and, surprisingly enough, no sacrifice seemingly is made in growth rate. It has been estimated that the probable cost will be from 1 to 1½ cents per pound of broiler. The hormone seems to stimulate appetite and cause the broiler to consume more feed during the fattening period.

At the Indiana Agricultural Experiment Station, a 30-day

feeding trial with 18-months-old males was conducted, using stilbestrol, a combinatiion of stilbestrol and thiouracil, and thiouracil alone. The stilbestrol and stilbestrol-thiouracil treatments produced better daily gains than birds receiving no hormones. Thiouracil alone had no apparent beneficial effect on market quality of birds in this experiment.

During a 38-day period, the pellet of stilbestrol in the necks of 10-weeks-old males did not affect rate of gain, but the treatment did improve the finish of the birds.

One commercial feed company has been experimenting with some fat-stimulating hormones but fails, so far, to secure very encouraging results. While an exceptionally well-fleshed bird was secured, the growth rate dropped while the hormone was being given. In the end the untreated birds, though not so well fleshed, had bigger frames and, consequently, were more desirable.

A somewhat better report comes from the University of British Columbia, in Canada. Research workers at this university tried both stilbestrol and dianisylhexene and found that these estrogens produced a distinct improvement in the market quality of the dressed poultry. The response was not uniform in all of the cases.

It should be stressed again that estrogen feeding makes birds capon-like, but not actual capons.

Many additional uses for hormone substances are suggested by the limited research to date. For example in aging animals with signs of declining fertility and sex urge, the feeding of suitable amounts of thyroprotein may restore these characteristics and save proved sires for many years of service and cows for additional production and reproduction. Thyroprotein as an addition to the feed in amounts suggested for laying hens may be expected to maintain more nearly normal sperm productioin in males during the summer months. In cockerels, it might be expected to hasten sexual maturity.

At the U. S. Regional Poultry Research Laboratory, East Lansing, Michigan, it has been shown that capons treated with the female hormone, stilbestrol, showed a much lower death rate from lymphomatosis (commonly called range paralysis) than untreated capons. The male hormone, testosterone, increased the resistance of males and capons to lymphomatosis, and this factor partially accounts for the lower death rate from this disease among males than for females.

Again, all is not well on the hormone horizon. There's a bit of disagreement and a lot of skepticism. Dairy-breed secretaries

fear that hormone feeding will upset their production records, many feed-company officials are apprehensive or hesitant, and drug manufacturers in many cases are interested but not actively engaged in testing or producing these substances.

And we must remember that improper use, either by a feed manufacturer or a farmer, could really upset the apple cart.

Old Pokey

Condensed from The Cattleman

Robert M. Hyatt

You meet him slogging leisurely through the woods in nearly every one of our states. He looks something like a woolly pig with long gray hairs mixed with white ones, black and white naked ears, white face, and a long prehensile tail, quite devoid of fur.

With mouth hanging open in a silly grin, he lazily pokes his long snout through some shrubs and regards you with berry-bright but stupid eyes. He is not wholly unfriendly, nor yet is he a cosmopolite. He hopes you won't dally there exchanging silly stares with him.

He is getting ready for his evening's prowl along streams and the margins of lakes, perhaps to a hen house, in search of food. Soon as you have passed on he'll wobble out on legs so short that his belly seems almost to drag.

He is Old Pokey, the Possum, a strictly American animal. Zoologists say that he is the dumbest and least aggressive of all animals. Anyway, dumb or not, Old Pokey is slowly extending his range and his numbers increase each year.

Perhaps the principal reason for this is, Pokey is the woods' greatest faker. Along his unhurried way he occasionally noses into trouble. Eagles, hawks and the big predatory cats seek his porky flesh; dogs and man hunt him. Tooth, claw, speed, cunning, horns, quills, armor, offensive secretion and savage noise—all these have been given to other animals for their protection. But Old Pokey received none of these devices. His sole defense, aside from shinnying up a tree, is to feign death. And for "playing possum" you can't beat a possum.

Hounds jump him; he curls into a dead-looking heap, his exposed teeth protecting his vulnerable throat. The hounds chew and shake; he sprawls in the prescribed limpness of death. The

Reprinted by permission from The Cattleman, Fort Worth, Texas, December, 1946

hounds, sore because they have been cheated out of the kill, give one final sniff and depart thinking all manner of ugly thoughts about possum sporting blood.

Old Pokey lies still. It is at these critical times that he probably figures that the life of a possum is sure hell. Yet a faint glow of pride must come over him as he thinks how easily he fooled those curs. And playing dead to several raging, ripping hounds is no mean trick when you consider that the hounds probably weigh at least 50 pounds, while their victim rarely tips the beam at nine pounds.

Long after the mauling, when the woods have quieted down, Old Pokey staggers to his feet, bloody and hurting all over, and walks away, hating dogs like fury. While he is the only animal that unflinchingly feigns death while an enemy tears or strikes with a club, he sometimes gets killed while playing dead.

Leading naturalists, who take sadistic pleasure in depriving a fellow of every decent attribute, believe that he does not deliberately adopt this method of self-defense; they suspect that the presence of danger is too much for his nervous system and that a slight yellow streak brings about temporary paralysis. Be that as it may, many a hunter has been severely wounded by a possum suddenly "come alive."

Old Pokey loves to eat but he is no epicure. He feeds upon what there is and doesn't grumble about the fare. Fruits, worms, berries, insects, snakes, small mammals and birds, carrion (I once saw a possum eating a tunnel through a long-dead horse), garbage, and almost anything edible that happens in his path. He particularly likes a fat hen but here his alleged dim-wittedness often displays itself. He will frequently begin eating his warm kill right in the hen house even though the surviving chickens raise a rumpus that brings the irate farmer hot-footing it with his shotgun.

There are no secrets about the possum's way of life but about his origin there is much ethnological head-scratching. Countless myths have arisen in regard to his mode of reproductiion, for the peculiar structure of the reproductive glands has given rise to many superstitious notions. This bit of mystery, which is enjoyed by all forms of life, the possum has not taken the trouble to clear up.

After mating, the embryonic young develop within the uterus for 11 to 13 days. During this period they are not provided with the complete equipment for receiving nourishment from the mother that other mammals have. But the membrane known as the chorion surrounding the embryo

functions in this way instead of the more highly developed placenta.

We should state here that the possum is the only survivor of the maternal-pouched ancient marsupials. This is a four-inch fur-lined expandable pocket that runs lengthwise down the mother's adbomen, a mighty handsome and capacious purse, and a ducky place in which to stow a mitt-ful of bothersome kiddies.

The possum young remain in their mother's body a shorter time than for that of other animals. At the end of the incubatory period, the young, appearing like minute living abortions, climb out and make their way "hand over hand" through a maze of hair to the opening of the pouch.

Young Pokey is the mite of the animal kingdom, being so tiny that it takes about 23 of him to equal the weight of a penny. At birth only his jaws and front legs are developed, and he has no eyes. Aided by his mother, the helpless grub squirms into the maternal pocket. Even then he has no assurance of survival, since the pocket usually has no more than 13 teats, and often as many as 16 young arrive. The unfortunate that can't find food must die; there is no taking turns, because the teat, once grabbed, swells in the baby's mouth until he can't let loose.

He "hangs on" in the furry darkness for a month, until one night he realizes he can get loose from the swollen teat. As big as a mouse now, and covered with soft down, he eases his head out of the pouch and discovers that he can see. Soon he ventures out to crawl over his mother's body with grasping, human-looking hands clinging to the fur.

When the mother goes on her nightly prowls for food her youngsters clamber onto her back, and entwine their slick little tails about her long tail, which she obligingly holds like an overhead powerline from which dangle a dozen little trollies. The tiny chaps are past-masters at clinging, and no amount of running or jumping on the part of the mother can shake their hold.

Not until they are nearly three months old are they weaned. When they are the size of small rats, they leave their carriage, but remain together in loose-knit family ties for another moon.

Before long Ma is getting her pouch ready for a refill. In the mild climes of our Southern states, three litters a year are common. When the second litter arrives, the first batch linger in the vicinity, often in the nest, for about two months, then wander away, feeling no qualms at parting.

Probably every state has a few

possums, although the animal doesn't like cold nor open prairies. Lacking all the defensive armament, he likes sticking close to trees, in climbing which he is no slouch, given a good enough reason. In the Southern states there is reason aplenty because many folks down there, especially the Negroes, have an insatiable craving for possum and sweet pertaters a-bakin' brown.

Old Pokey doesn't sport much of a coat although his hairy pelt will bring from a dime to a dollar, depending on its condition. He ranks as an important animal in the fur trade, about eighth in value to the trapper. This is not based upon the price the pelt brings but because of the enormous number of possum skins taken each year.

Large quantities of these skins were formerly exported to Europe, where they were dyed to simulate skunk. In this country the better northern hides are made into jackets and coats, but the chief use is in trimming for inexpensive coats and other garments.

You'll meet Old Pokey from Canada to the Argentine, finding him in greatest numbers along the south Atlantic seaboard states. That he has been with us a long time is proved by fossilized skulls found in Montana not long ago. These possum skulls showed that he had lived during the time of Cretaceous dinosaurs—ferocious monsters that couldn't adapt themselves to changing conditions and checked out several million years ago.

It is said that Old Pokey was named by the Indians of Virginia, where he was first seen by the colonists. He is practically the official animal of Dixie.

Feed New Hay First

If you have some hay carried over from previous years, it is best to feed new hay and continue to hold the old, North Dakota extension specialists suggest. Reason: Most of the vitamin A is lost in a year, but the feed is just as good as a source of energy. So it is best to feed the new hay while it still has that vital element in it, and keep over the old for a year of short crops and emergency or feed need.

—*Cappers Farmer*

New Life for Old Pastures

Condensed from Science on the Farm

J. K. Thornton

MANY old pastures in Pennsylvania, low in productivity, can be given new life by renovation. In many cases, this renovation can be profitable despite costs of seeding, fertilizing, and liming.

Weed-covered abandoned fields are a familiar sight in various sections of the state. Just such a field, considered so worthless that a part of it was left out of the trial in order to straighten a fence line, was chosen in 1942 as the location of a pasture improvement project at the Pennsylvania Agricultural Experiment Station. Yet today, that "worthless" field is sustaining a good-sized dairy herd, has been cut for a nice hay crop, and promises to make splendid grazing for years to come.

As every farmer knows, land which has been abused for a generation requires liberal amounts of fertilizer. Others however require heavier applications, tillage and re-seeding.

Pasture renewal generally can be divided into three sets of conditions. In the first, existing sod can be given new life by spreading lime and fertilizer followed by proper management. Usually the better grass and legumes will re-establish themselves without re-seeding.

The second set of conditions requires seedbed preparation by thoroughly tearing-up the existing sod with a heavy disk, spring tooth harrow, field cultivator, or other tool. Old sod is usually best worked during August or September, when its vitality is lowest. Torn sod, roots, and other matter left at or near the surface will add organic materials to the soil, and at the same time help control erosion. This land can then be re-seeded in early spring, using any desired seed mixture, but no nurse crop.

Under the third set of conditions, rotation of crops enters to completely kill off existing vegetation. Usually a cultivated crop like corn is grown the first year. Then a cereal crop (oats, barley or wheat) is employed the second year, in which the grass-legume mixture is seeded. The third or succeeding crop may be hay, grass, or pasture, or any combination of these uses. In establishing this kind of sod, heavy fertilization and lime are applied at the time of planting the cereal crop.

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Seeding combinations should be carefully chosen. Work at the U. S. Regional Pasture Research Laboratory at State College indicates a trend towards the larger growing grasses and legumes. One of the best combinations, useful in virtually all parts of Pennsylvania is the Ladino clover and orchard grass mixture. Other desirable combinations are: orchard grass with alfalfa; bromegrass with alfalfa; or bromegrass with Ladino clover. An important consideration in compounding the seed mixture is to keep the rate of grass seeding down, so that it will not interfere too much with establishment of the associated legume. In some instances, it may be well to add 2 pounds of red clover to a mixture to increase production the first and second years.

One of the most important factors in renovating any pasture is the management during the seeding year. If the sod was seeded in March it will provide some grazing during the period from July to September of that year. However, the tendency is to overgraze in this critical period of establishment of the new sod. Moderate, controlled grazing the first year will pay bigger dividends in the following years in the form of a longer-lasting and better sod.

After the seeding year, renovated pasture has been found to produce more feed during midsummer than most permanent pastures produce during the entire summer. Growth on renovated areas may be utilized for hay, silage, or pasture, as the occasion demands.

To illustrate the results obtained in renovating the "worthless" land of the "Barrens" at this Station, it may be wise to review the procedure used. Similar experimental plots are under study in other sections of the state, with other methods and other mixtures, but results have not yet been compiled over such a long period of years.

Plans to improve this pasture were first made by P. D. Jones, college dairymen, in 1940. In 1942, 8 loads of stable manure, each reinforced with 250 pounds of ground limestone and 50 pounds of superphosphate were applied per acre. In 1943, chicken manure was applied at the rate of 3 loads per acre. Bluegrass and redtop developed so rapidly on the better parts of the field as to demand attention, so grass and weeds were cut, and pasturing followed.

A bush and bog harrow was used to tear up the sod in the fall of 1943, four cultivations being necessary to do a thorough job. In April, 1944, the field was gone over twice with a disk and twice with a springtooth harrow. The field was then seeded to Ladino

clover at the rate of one pound per acre. The field was cultipacked after seeding.

A good crop of high quality clover hay was harvested in 1945. Only Ladino clover was seeded; the bluegrass came in strong, naturally. During 1944, the field was grazed and cut. Last year the renovated area produced a hay crop, and was also used for grazing.

This year the renovated pasture is being used primarily for grazing a large herd of dairy cattle. To compare the three portions of the field, actual measurements were taken this summer to determine both yield and percentage of clover in the field.

The renovated portion of the area was found (July 1) to be producing 2,181 pounds of air-dry forage per acre, although the actual yield was larger, since the measure was taken while the field was being grazed. The forage cut from this renovated area was found to include 58.1 per cent clover. Part of the field, fertilized in the same way but not renovated, was found to be producing 1,390 pounds of air-dry forage per acre containing only 1 per cent clover. Total yields for the season were more than twice the figures listed.

The untreated, non-renovated section of the same area was still weed-covered, and was producing only 201 pounds of material per acre, with no clover found there.

Objections have been raised that treatments applied to this field have cost far more than the land is worth. If poultry manure is valued in accordance with plant nutrients contained, $4 or $5 per ton, this is doubtless true, but hay might be valued at $20 per ton, and pasturage at similar rates, making the venture appear economically sound.

New Life for an Old Vine

Condensed from the Southern Agriculturist

H. P. Stuckey

THE scuppernong grape waited a long time for a strong sympathetic hand to come along and give it a lift. From the day Sir Walter Raleigh landed in Roanoke Island and found it growing in its natural state until recent years, the scuppernong has been grown in many back yards and home vineyards of the South.

A few years ago, however, Georgia's Cason J. Callaway gathered around him at his Blue Springs Farms at Hamilton, Georgia, research workers, small nurserymen, farmers, and processors to develop the scuppernong as a cash crop for the Southern farmer.

The scuppernong is a variety of the Muscadine group of grapes, and in recent years many new varieties, white and black, have been developed. By improving the varieties, yields of these grapes have been increased from 15 to 20 per cent, and the sugar content of the juice increased from three to five per cent. The number of grapes in a cluster has been more than doubled, though no varieties have yet approached the large clusters found among the varieties of bunch grapes such as Concord and Niagara. In addition, all varieties of the Muscadine group now in cultivation are sufficiently resistant to attacks of insects and diseases so that no spraying is necessary.

The best of the new varieties have been planted and fruited at the Blue Springs Farms on a commercial scale—not only to demonstrate practical methods of producing the grapes on a tonnage basis, but to interest processors and consumers in the merits of this "diamond mine" crop at their very doorsteps.

With the development of the mechanical cotton picker, there will be a greater surplus of unskilled labor formerly used for picking cotton. The growing of scuppernong grapes as a supplementary cash crop on both large and small cotton farms will surely have its place, for the scuppernong requires considerable hand labor, much of it to be done in and out of the cotton chopping and cotton-picking seasons. The production of these grapes is a good enterprise for small farmers, because the grapes can be grown and harvested by the families and delivered to some convenient central point for sale.

For the past three years sales of this kind have been made at

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the Georgia Experiment Station. Mr. Callaway and grape buyers first agreed on the price for the grapes. The buyer sent large trucks to the experiment station, as a central point, where the grapes were collected, weighed and loaded, each grower being paid directly by the purchaser and processor. This relieved the small growers from hunting markets, and pleased the processor because it enabled him to get grapes in quantity with no effort on his part to collect the various lots at one central point.

The successful culture of the scuppernong is confined largely to the same area adapted to cotton culture. If the outdoor temperature goes below zero F. for any considerable time during the winter, scuppernong vines are likely to be damaged by cold injury.

Commercial vineyards planted on well-drained, fertile soil, suitable for growing cotton, corn, or truck crops, will produce from three to five tons of grapes to the acre. In recent years, processing plants have paid from $40 to $200 per ton for the fruit.

The vines are usually set about 21 feet apart in the row, trained in a two-wire trellis, and the rows spaced 14 feet apart. Soil conserving cover crops are grown between the rows of vines, though clean culture is given a strip along the rows, a procedure essential for young vines. The vines are pruned in November, and fertilized in early spring. The plant food requirements of scuppernong vines are very similar to those of peach and apple trees. About 400 pounds of 4-8-6 commercial fertilizer to the acre, along with leguminous cover crops, will maintain the fertility of the soil.

It costs from $75 to $100 per acre to establish a vineyard, and about $25 per year to maintain it up to the third year, when it produces its first commercial crop of fruit. It should reach full bearing by the fifth or sixth year, and bear indefinitely from then on. Vines planted at the Georgia Experiment Station in 1872 are still producing good crops of fruit.

There are some 25 to 30 distinct varieties of the scuppernong or the Muscadine group of grapes. Practically all of them are well suited to the production of wine, unfermented juice, frozen grape pulp, jellies, jams, and to be eaten in the fresh state. They do not ship well in the fresh state and will keep only a few days outside cold storage.

There is a growing demand for fresh grape juice.

The future of grape culture is bright in the South. And the scuppernong—one of the most luscious of all grapes—should lead the way in the coming cash parade.

Bur Clover Comes into Its Own

Condensed from the Seed World

Harold Severson

THE rapidly increasing popularity of bur clovers as winter cover crops in the cotton-growing states is based upon their many virtues. Bur clovers are winter annual legumes that can be used as combination cover and green manure crops and for grazing purposes. Their ability to maintain themselves with little or no reseeding endears them to cotton farmers.

The two most common species of bur clover in the United States are the spotted or southern bur clover and the California or toothed bur clover. The spotted clover is much better adapted to conditions in the cotton South than California bur clover although the latter is found in the less humid portions of eastern Texas and in parts of southern Oklahoma. Southeastern farmers are using other varieties of bur clover including the Southern Early Giant, California, Tifton, Button and Manganese. They seem adapted to a wide variety of soils. They make a fair growth on slightly acid soils but respond to lime. The seed must be inoculated.

On a recent trip through southern Georgia, a party of Soil Conservation Service workers stopped at a farm near Albany to observe a planting of Manganese bur clover. This is a relatively new winter cover crop. Discovered back in 1928 by A. Lee Andrews, a farmer of LaFayette, Alabama, it is just coming into its own as a cheap and easily handled legume that can be used for pasturage as well as a cover crop. It is a species of southern or spotted bur clover but is different in several respects, including the fact that it is about one to three weeks earlier than the old strains.

Because of its advantage in maturing early Manganese can be turned under earlier than spotted bur clover in seasons when the seed is allowed to ripen. Manganese must be permitted to mature at least once every four or five years to assure continued volunteering. In this manner, once the stand has been established, Manganese bur clover will volunteer from year to year. This makes it a very economical legume for the South. It produces an abundance of seed which is usually collected by sweeping or raking the ripened pods from the ground. In some large areas, notably in California, suction

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machines are used to collect bur clover seed. This state supplies the bulk of the commercial seed of California bur clover while practically all the commercial seed of spotted and Manganese bur clover is grown in the cotton states.

Manganese bur clover has developed into good pasturage for cattle. They are turned into clover fields in Alabama around December 1 and continue to graze until around April 1 to April 10. The cattle are then removed, the plants permitted to go to seed, and an excellent stand is obtained for grazing the following year. It grows more rapidly in the fall months than common or spotted bur clover.

At the Alabama Experiment Station, large yields of grain sorghum have followed this clover. The ground is plowed, the dried bur clover plants being turned under rather shallowly, and hegari planted in mid-June at the rate of six to eight pounds per acre in 3½-foot rows. One farmer of Opelika, Ala., follows Manganese clover with soybeans or Johnson grass. He gets excellent results in this manner. Manganese probably will do in the same area suited to Spotted or Southern clover. Mr. Andrews, discoverer of Manganese clover, claims it will grow as far north as Virginia, Arkansas and Oklahoma.

Another variety of bur clover that is attracting increasing notice is button clover. A strain found in Wilson County, Tennessee, and closely studied at the Middle Tennessee Experiment Station by Dr. L. R. Neel, head of the institution, is said to be much more winter hardy than button clover from other regions. The Tennessee strain belongs to the sub-species of Medicago orbicularis known as micocarpa, according to Roland McKee, senior agronomist, Forage Crops and Diseases, Bureau of Plant Industry.

Until recently, button clover had made little impression upon the agricultural program of the upper South. It came into this country from the Mediterranean region in 1899 and more seed was brought to the United States in 1902. About 25 years ago, button clover was found growing on lawns and vacant lots in Lebanon, a small town in Wilson County, Tennessee. Farm people noticed cattle and horses liked this new clover, so they hired little Negro youngsters to pick the button-like seed pods. In this humble manner did production of button clover seed get underway in Tennessee.

Today several hundred acres of button clover are being grown in this Tennessee county and a considerable acreage has been seeded in Sumner county. Tests are being made of this clover at

the Middle Tennessee Experiment Station under the watchful eye of Dr. Neel. Writing in the Southern Agriculturist, Dr. Neel had this to say about button clover:

"It is valuable as a winter pasture plant, it makes a good hay and is a valuable soil-improving legume when pastured off or when plowed under. A strong point of button clover is its hardiness. It survived and steadily spread on the rocky soil in Lebanon where the lime rock lies just under a thin coating of soil often less than an inch thick. Seed produced in the spring, protected in the button-like pods, keep until late summer and then germinate. When the pastured crop is allowed to make some seed or where enough seed is wasted when the crop is being harvested, the seed comes up in late summer or early fall and makes a stand. It does much better, however, if the land is well disked."

It normally lasts through May and a part of June, thus making it last a month longer than crimson clover. Dr. Neel says the seed is more easily saved than that of crimson clover. In addition, it has the advantage over the old varieties of crimson clover in that it volunteers so readily. It's true that a hard-coated strain of crimson clover has been found but Dr. Neel feels button clover will continue to have a definite place in the pasture program. The seed of button clover is saved by cutting the plants with a mower, bunching with a rake, and then threshing in much the same manner as crimson clover seed.

Large areas in the Mississippi Delta are being planted to southern or spotted bur clover to increase cotton yields. The territory for growing of southern bur clover is a large one, taking in all of Louisiana, Mississippi, Georgia, Alabama, South Carolina and portions of North Carolina, Texas, Oklahoma, Virginia, Arkansas and Tennessee. Bur clover may be pastured by the middle of February in North Carolina but near the Gulf Coast it furnishes practically continuous winter grazing. Tifton bur clover, developed at the Coastal Plains Experiment Station at Tifton, Ga., is said by Mr. McKee to be the most hardy of all bur clovers and will survive most winters as far north as Washington, D. C. No current experimental work has been carried out with button clover, so little is known about this clover's ability to withstand the colder temperatures of states north of Tennessee. It may be equally as hardy as Tifton bur clover.

Bur clover re-seeds itself almost indefinitely on pasture lands. On cultivated land, cotton and corn must be planted before the seed, for it would not be pos-

sible to wait until the bur clover seed has been ripened and the dried plants plowed down. However, this is possible with grain sorghums and soybeans, which can be planted as late as June.

Some farmers in the cotton states plant their row crops from four to seven feet apart to permit the bur clover to ripen in the spaces between the rows. The clover stays there until the burs are ripe. Then the dried plants are turned under and cowpeas, soybeans or hegari planted over them. Most farmers prefer to grow the bur clover in a separate patch for seed purposes. The seed is gathered when ripe and sowed in the cultivated crop when desired.

Timber Pasture

According to Wisconsin tests, the average woods pasture yields only about 276 pounds of dry matter to the acre yearly. This is enough to feed an 18-cow dairy herd for half a day. Unimproved open pastures on the same farms yielded 1,453 pounds, and renovated pastures limed, fertilized, and seeded to legumes, produced 3,210 pounds. In addition to the low returns on woods pastures, the grazing has been demonstrated to be a serious hindrance to woodlot growth and development. The University of Wisconsis recommends that livestock be kept out of so-called woods pastures. You can actually make a higher financial return from land by practicing good woodlot management and harvesting regular crops of timber from it.

—*Successful Farming*

No More Bugs to Bother Them

Condensed from The Farmer

William H. Kircher

STOCKMEN now have an effective tool with which to fight cattle grubs and lice, house flies, stable flies, and the vicious little horn flies. It is the decontamination rig used successfully by the Army against South Pacific mosquitoes during the war, or the commercial orchard spray rig in either of which pressures up to 600 pounds can be developed, and through which enough insecticide can be forced to spray building interiors and livestock quickly and efficiently.

First of the jobs to be done with this equipment is spraying cattle for lice and grubs during the winter, but before surveying the probable effectiveness of that program let's see what has been accomplished during the past few months in the war on flies.

What first excited cattlemen about the possibilities of high-pressure spray rigs loaded with DDT as a means of fly control was an experiment conducted at Kansas Agricultural Experiment Station. Range calves sprayed with DDT gained as much as 59 pounds per head more than unsprayed calves during a 150-day pasture season. That is a little more than a third of a pound a day, and valuing the gain at current beef prices it would be worth about $10. Cost of spraying will not exceed 20 cents a head for each spray, and for materials alone not more than six cents. Even if the cattle have to be sprayed as many as five times during the summer and early fall, the owner is getting a return of $10 for each dollar he spends for the insecticides and for labor.

One man who figures that he has been getting fully that high a rate of return is Roy Houck, Potter County, S. D., registered Hereford breeder, and owner of about 950 head of cattle. When we visited his ranch recently he told us: "We seldom see a horn fly around here any more, and I'm sure that getting rid of them has been as profitable as the Kansas experiment indicated it would be."

The day we visited the Houck Triple U Ranch, a herd of about 100 young bulls was being sprayed. It had been planned to start spraying the 700 head on range, but rain prevented that. About 30 of the young bulls at a time were driven into a crowding pen, and Mr. Houck with one helper walking on 2x12-inch

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planks laid across the top boards on the pen fence sprayed the bulls' backs, running two three-jet spray booms simultaneously.

After being sprayed in the pen, the bulls were driven through a loading chute in which there was a triangular, six-jet steel spraying frame. The insecticide was forced through the jets under enough pressure that not a square inch of the bulls' bellies escaped dousing. It might be guessed that the animals eyes would be injured by such high pressure spray, but not an animal on the Houck ranch has had eye trouble although all of them have been sprayed several times.

On the Houck range we saw cattle that had been sprayed four weeks before, and in spite of its being the kind of day when horn flies would have been bothering them, we watched carefully for flies on perhaps 150 or more head, and we saw only a total of four flies! Nearby were cattle that had not been sprayed and there were big patches of flies over their withers, and for two or three inches up from the base their horns were literally encapsulated with horn flies.

Around the Houck barns at the ranch head-quarters one saw scarcely a fly. In the barn, which had been sprayed several weeks before, horses munched their grain and there was never a switch of the tail or stamp of the foot. The cool, wet weather should have attracted flies by the thousands to the screen door on the house porch, but there were none there, either.

Mr. Houck had for several years followed the practice of using nicotine and creosote to destroy cattle lice and has a large and costly dipping vat for the purpose, "but," he said, "it never seemed possible to get complete control. Since using the spray we don't find lice any more; not even the blue, blood-sucking kind that used to cause so much trouble." Commenting on the ease and rapidity with which the spraying job can be done, Mr. Houck said that the last time 700 head on range had been sprayed seven men did the entire job in less than a day. There are seven pastures on the 6,000 acres of summer range, and the rig had to be moved from the corrals in one pasture to those in another, so it is evident that very little time is required for the actual spraying of the cattle.

Until the high pressure sprayers were available, dusting the backs of cattle with rotenone powder was considered the best way of destroying cattle grubs. Now spraying at 600 pounds pressure with the spray jets held not more than 15 inches from the backs of the cattle is considered the best method of destroying grubs. With this much

pressure the small scabs covering the grub air holes are knocked off and the insecticide is forced into the tiny holes. The first spraying for grubs should be done shortly before Christmas, and the second spray in about 30 days, or about February 1st.

So successful have been the experiences with high pressure spray rigs that the South Dakoto Extension Service got 19 truck type, two trailer type and five skid type rigs from the Army, all except two of which have been assigned to various counties in the state. It is hoped that before spring there will be enough so that every county may have one.

"The operation of the machines," says James J. O'Connell, extension animal husbandman, who has charge of the program, "will be under the supervision of the county agents who will hire someone to operate them. The county agent will organize spray rings, and the man who operates the equipment will collect from the farmer or rancher for the work he does. It is figured that it will cost about 20 cents per head for cattle, 10 cents for sheep, five cents for hogs, and $5 per set of buildings."

Going into more detail concerning the program, Mr. O'Connell said that one goal is to have cattle-grub-free areas accomplished by all farmers and ranchers in a given area taking part in a grub control program. This will, of course, spell the doom of heel flies in those areas too because heel flies are one stage of the life cycle of the grub. Cattle will be sprayed for lice and flies as well as grubs. Sheep will be sprayed for ticks, and hogs for mange and lice.

The South Dakotans aren't going at this widespread program without first having had experience to determine its effectiveness. Jerauld County bought a rig last spring and under the supervision of the county agent sprayed 10,000 head of cattle with it during the summer with excellent results. Harding, Meade and Pennington Counties carried out a successful grub control program.

Considering the rapidly increasing popularity of this means of livestock pest control, it is quite unlikely that one rig per county will do the work, but says Mr. O'Connell: "It is only a start." One can agree that it is only a start when in addition to the use of machines in control of flies, grubs, ticks and lice they also have a wide field of usefulness in weed control.

Rice Growers Dry Their Boots

Condensed from Farm and Ranch

Sam Whitlow

For the United States as a whole, some 1,500,000 acres of rice were planted in 1945. Of this amount, Louisiana had about 580,000 acres and Texas about 400,000. Most of the remaining amount was produced in California and Arkansas.

For the Louisiana-Texas area, the average yield was somewhere between 10 and 15 barrels per acre. The selling price was between $6.50 and $7 a barrel, so it takes no stretch of the imagination to realize the importance of this crop in the Gulf Coast area. Production costs, based on the latest available estimates, are about $70 or a little more, per acre.

The biggest problem faced by the rice producer is that of maintaining production. Rice drains heavily on soil fertility, and for this reason it is planted on the same land every other year, as a general practice. However, under this system the rice yields are declining. Considerable interest now is being centered on a rice and improved pasture rotation whereby increased beef yields can be made on the better pastures and increased rice yields can be realized on the land following the improved pastures. Where improved pastures are used in this manner, rice will be planted to the same land only every third or fourth year.

In Jeff Davis parish in Louisiana, County Agent G. B. Martin says that where a rice crop follows a crop of lespedeza, an increase of 2 to 3 barrels of rice per acre can be expected, as compared with rice following volunteer grasses and weeds. In addition to improving the rice yields, the lespedeza has the three-fold advantage of improving the soil, supplying better grazing for cattle, and serving as a seed crop.

At Louisiana State University, M. G. Sturgis, experiment station agronomist, and his staff have found in tests that the annual yield of rice has been increased 6.4 barrels per acre in rotation with improved pastures.

During the past several years, the combine has come to the Gulf Coast rice-producing areas on a wide scale. Probably more than 50% of the rice in the Louisiana-

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Texas area in the 1945 crop was harvested with combines. With the coming of the combine, the strawstack is disappearing. And as it disappears, the rice farmers are losing a source of feed, since the combine scatters the straw all over the ground.

This is one big reason for the wider interest that is being shown in improved pastures. In the rice-producing areas, a combination with cattle is a "natural" because the animals can be grazed on the land in off-rice years.

The combine is a big labor saver. Ordinarily, 19 to 21 men are required to operate a threshing outfit. With a combine, two or three men can do the same amount of work. And the farmers also report that the combine is a more efficient harvester—it will harvest from 1 to 3 barrels more an acre than the old harvesting equipment.

But with the coming of the combine has also come the problem of drying the rice. Previously the rice had been dried in the fields. But with the combine, drying facilities had to be established. And here another problem was encountered. Certain varieties of rice could be used better in the drying process.

As an example, Blue Rose has long been a favorite with the rice farmers. But combine experience has shown that it needs a stiffer straw to hold it upright, and that it ripens slowly and is hard to dry. For this reason, it is losing popularity.

Rice has a moisture content of about 18%, and unless it is dried under proper conditions, the cellular structure of the rice will tend to break down, and the grain proceeds to disintegrate.

The latest, and probably the greatest, mechanization of rice production in the Gulf Coast area is the planting of rice from a plane. Jefferson county has taken the lead in this work in 1946, where between 5,000 and 6,000 acres have been seeded from the air this year. The county's total rice average is about 65,000 acres.

Planes have been used to plant sprouted rice seed in flooded fields, and also to plant dry rice on dry fields. In practically all cases, the planes were used to fertilize the ground prior to planting. This aerial fertilizing and planting is expected to be used much more widely in 1947.

Every rice crop must be fertilized. Generally speaking, phosphate is the "most needed" fertilizer. Rice does best on slightly acid soil, somewhere between pH 5.5 and pH 6.

Research men indicate that, in order to improve the varieties of rice in the future, the rice plant must have a sturdy straw to hold it upright; it must ripen rapidly and have a good yielding capacity; it must have good cooking

and milling qualities; and it must be resistant to the common diseases. These characteristics now are all available, but the problem is to combine all of the desirable characteristics into one variety through hybridization and selection.

Concerning the varieties of rice now in use, Rexoro (old Patna) remains the most popular in the Gulf Coast area. In Texas, the Texas Patna, Bluebonnet and Fortuna are still popular, along with Zenith and Nira. In Louisiana, Early Prolific is still used on a fairly wide scale.

Management Program Controls Starlings

Condensed from Farm Research

A. A. Allen

THE starling is a native of the Old World, where it is common throughout the continent from Norway to northern Italy and in the British Isles. During the fall and winter, flocks from the Continent augment the already heavy population in England to form roosts of enormous size. Nineteen of these roosts are reported to have been occupied for more than 40 years, and one for at least 180 years. With its increase in numbers during recent years, the species is apparently exhausting its natural food and becoming increasingly destructive to cultivated cereals and fruits. Its economic status is changing from that of a distinctly beneficial species to one that is a great nuisance and perhaps a menace.

The starling was introduced into Central Park, New York City, in 1890. For five years it was found only in New York City, but by 1900 it had extended its range up the Hudson Valley to Ossining, eastward to Norwalk, Conn., and southward to Plainfield, N. J. Ten years later it was well established in Philadelphia, Providence, and Albany. By 1916 the starlings were nesting at Ithaca, Boston, and Washington, D. C.; and a few were reported west of the Alleghanies. During the next decade they spread over southern Canada, westward through Ohio, and south through North Carolina. A few birds were reported as far west as the mississippi, and some nearly to the Gulf. Twenty years have passed since then, and the starling is now the commonest bird throughout much of the East, outnumbering the English sparrow and the robin; it has moved as far north as Hudson Bay, as far south as the Mexican border, and as far west as Utah.

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In this country, as in Europe, the starling has passed through the beneficial stage in many areas and is not only a nuisance but downright destructive. Starling roosts along city streets and on public buildings are a menace to public health and cleanliness, and in some areas these birds destroy more small fruits and green corn than do all other birds combined. Either their numbers must be reduced or their population so managed as to reap the maximum benefit from their insect-eating proclivities without suffering the maximum losses and inconveniences caused by local concentrations.

In New York State, dairying and vegetable-growing areas derive a great deal of benefit from the starlings' appetite for white grubs, Japanese beetles, alfalfa weevils, millipedes, and other pests that are overlooked by many birds. On the other hand, cherry orchards and fields of sweet corn sometimes suffer from 25 to 50 per cent loss from starling damage. One grower of sweet corn in Livingston County spends more than $800 a year on labor and ammunition to keep the flocks of "black birds" out of his fields. Cherry growers in Seneca and Orleans counties report more than $1,000 loss to certain of their orchards.

A control or management program should take into account the following facts: (1) complete extermination of these birds is neither possible nor desirable. Rather, their services should be utilized wherever possible and their presence discouraged where they are not wanted.

(2) The majority are now distinctly migratory, and it is more than likely that a large percentage of the birds making up the roosts in New York State, were raised and nested outside of the State. The destruction of these roosts probably would not help the cherry growers of New York State one iota. On the other hand, if the nesting populations of Seneca and Ontario counties could be controlled, it might help the cherry growers in June and July, but it would not, necessarily, help the corn growers, whose crops mature in late August and September after the migration has started.

With these facts in mind, the Laboratory of Ornithology at the New York State College of Agriculture at Ithaca started a few experiments in 1944. The first thought that occurs to everyone is the development of a spray that might make cherries unpalatable to starlings without injury to the fruit for human consumption; something that could be washed off easily and that would not permanently injure the flavor. Since starlings are so omnivorous and their tastes so indiscriminat-

ing, there was little hope of discovering any such deterrent, and careful experimentation with soap, lime-sulphur, nicotine sulfate, and other sprays gave no encouraging results.

The second set of experiments on starling management was based on the idea of controlling local populations. Breeding starling populations offer a real opportunity for management because of their nesting habits. Starlings never build open nests in bushes or trees, but always place them in crannies about buildings, or in holes in trees. Such places are comparatively limited. A further study of their habits showed that they prefer places where there are no natural enemies, as squirrels or rats, to compete with them. Thus was conceived the idea of placing boxes for starling nests in the most desirable locations, which proved to be on roadside telegraph poles about 10 feet from the ground. During a three-year experiment practically the entire population of the 2-mile-square test area accepted the boxes for nesting. These were of durable construction, of half-inch cypress, 7x7x16 inches, with a sloping top. The circular 2-inch opening was 1½ inches from the top on the front side and the lower 8 inches of the front was hinged to facilitate inspection.

Theoretically, it would be possible to get all of the nesting starlings of a given area into boxes where they could be "managed." On this particular area, it was decided, arbitrarily, for the sake of the cherry growers, that the starlings were undesirable. Under experimental conditions, cyanogas was found extremely effective in destroying both starlings and eggs.

In this experimental setup, the initial cost of the boxes and the amount of time required to service the boxes were out of proportion to the number of starlings actually removed from the area. Set up on a country-wide basis, however, with thousands of boxes, the cost per box or the cost per starling removed would be nominal. In areas where the starlings are desired, the boxes would serve to attract and increase them, but always they would be in such a vulnerable position that they could be controlled whenever desired.

The general conclusion of this study is that management of starlings is feasible through control of the nesting populations. When the country is sufficiently aroused by their depredations to enter into an extensive campaign for their control and will provide a sufficient number of properly constructed and properly placed bird houses, properly serviced, the starlings need no longer be a problem.

Producing More Profitable Poults

Condensed from The Southern Planter

Morley A. Jull

Most flocks of growing turkeys use too many pounds of feed per pound of turkey meat produced. The number of pounds of feed consumed per pound of turkey raised to marketing time is one of the most important factors affecting returns from the turkey enterprise because feed costs normally represent more than one-half of the total cost of raising turkeys.

Always keep in mind that the number of pounds of feed per pound of turkey raised is influenced by the amount of mortality, since the feed consumed by the birds that die must be included with the feed consumed by the birds that live. If turkey raisers by proper management keep mortality at a minimum, the returns from turkeys are determined largely by rate of growth and fleshing ability of the poults.

The kind of turkey that gives best results is the kind that grows rapidly, has good body type, and is well fleshed at marketing time, especially over the breast and thighs. These are the things in which farmers and commercial turkey raisers are particularly interested. Turkey breeders are also interested in good egg production and high hatchability. Turkeys bred for these desirable characteristics are more profitable than flocks that have not been improved by selection and breeding.

As a turkey breeder, your primary objective should be to develop strains of turkeys that produce the most meat on the least feed in the shortest time.

You must have a rapid-growing strain of turkeys for the most efficient conversion of feed into meat. Progeny of large-sized breeding stock tend to grow more rapidly than progeny of small-sized breeding stock. Males grow faster than females.

Select Rapid-Growing Poults for Breeding. In order to develop a rapid-growing strain, go over your poults before marketing any of them and select for future breeding purposes the best developed males and females, providing they are otherwise desirable in body conformation. Select

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at least one-third more than will eventually be used and band them. The size of bird to be kept for breeding purposes depends, of course, upon the approximate size of market bird you wish to produce according to the variety of turkey you keep. Reject all late-maturing birds. If you are trap-nesting your breeding hens and carrying on pedigree-breeding work with single-tom matings, be sure to select prospective breeders on a family basis.

Reject Birds with Abnormalities. Do not save for breeding purposes any poults with serious defects and disqualifications. Also, do not save any young toms and hens that possess deformities or other abnormalities, because some of them may be inherited. These objectionable characteristics include crooked keels, calluses on the keel bone, deformed beaks, crooked toes, deformed feet, deformed backs, and pendulous crops. If abnormalities are prevalent in certain families, it would be well to reject the entire family.

Select for Good Conformation and Fleshing. The type of body in turkeys, in addition to the amount of fleshing over the breast and on the thighs, has a marked influence on common acceptance when the birds are dressed for market. A well proportioned body usually gives a dressed bird a plumper appearance than a poorly proportioned body, even though both carcasses may have the same amount of meat. It is very important to select future breeders on the basis of body conformation and fleshing before any birds are marketed.

Besides having rather definite proportions with respect to length of shank and keel, and depth of body in the poults you select for future breeding purposes, each bird must be well "balanced." The legs should be placed squarely under the body. In some birds the legs are so far back on the body that the bird tilts forward when walking. Other birds, although having well proportioned bodies with legs set squarely under the body, are too heavy in front because the shoulders and adjacent parts of the body are over-developed proportionally. Do not use such birds as breeders. Good length of keel in relation to depth of body is desirable. A keel parallel with the body gives the dressed bird a good appearance. A bird with a "rocker" keel is undesirable and should not be used as a breeder. A bird much shallower in rear body depth is undesirable and should not be used as a breeder.

In addition to uniformity in conformation in your flock, you want each bird in the flock to have an abundance of fleshing over the breast and on the thighs

at time of marketing. Width of breast is apparently the most important single factor determining the amount of fleshing over the breast and the appearance of dressed birds from the consumers' stand point. As a matter of fact, among poults of the same age, breast width has much more effect on variation in weight than shank length. In selecting prospective breeders from among the poults, measure breast width at a definite height above the apex of the keel. Apparently the best place to determine breast width is about 2 inches back of the anterior point of the keel and about 3 inches from the apex of the keel. Selecting poults for breeders every year on the basis of width of breast will do much to develop a strain of turkeys noted for good fleshing over the breasts, which means so much from the standpoint of consumer preference.

It is possible to develop a strain excelling in breast fleshing without actually measuring breast width of the prospective breeders. You may estimate the degree of fleshing over the breast by the "feel" of the hand. This method has the advantage of being able to estimate the relative amount of fleshing over all of the breast from front to rear. Turkeys are sometimes well fleshed over the fore part of the breast but poorly fleshed over the rear portion because the breast musculature narrows rapidly from front to rear, producing a pronounced horizontal V-shaped breast that does not have good consumer appeal.

In order to estimate breast fleshing by hand, get an assistant to hold each turkey in his lap with the turkey's breast up and its head toward you. Part the breast feathers and run your hand over the breast and estimate the amount of fleshing. You will find it a great help in selecting your prospective breeders if you classify your turkeys into three grades, broad, medium and narrow, keeping only the birds that qualify as "broad."

Go over your grading of the poults on a family basis and see which families of full brothers and sisters are superior to other families of full brothers and sisters. Then, compare the progeny of each sire with respect to your grading for breast fleshing. By concentrating your selection of future breeders from among the progeny of the dams and sires that proved to be the best breeders you are certain to make more progress in developing a strain of turkeys noted for good breast fleshing than by selecting the best poults regardless of their ancestry.

Good egg production is necessary if you want to produce hatching eggs or poults economically. The higher the egg produc-

tion during the hatchery season, the lower the feed cost of each dozen eggs produced.

Egg production in turkeys is inherited. The conditions under which turkeys are kept, the kind of diet fed, and other factors affect the number of eggs laid, but even when all birds in a flock receive the same treatment some lay poorly and some lay well. By adopting a program of selecting the right kind of breeders, the egg-laying ability of almost any flock can be improved.

Artificial Lighting Stimulates Early Production. Many flocks of turkeys start laying so late in the spring that it is practically impossible to have the poults in well finished market condition for the Thanksgiving trade. During recent years the demand for hatching eggs during February and March has been on the increase so that it is desirable to have the birds in good laying condition by the latter part of January, or even earlier. Artificial lighting is an efficient way to stimulate early laying.

Since the ovary and oviduct of the female respond more quickly to the influence of artificial lighting than the reproductive organs of the male, it is necessary to put males under lights about one to three weeks earlier than females in order to secure good fertility by the time the females are laying well. The following table will serve as a guide for the time to start lighting females according to the time you want your flock to be in good production and the time to start lighting males to secure good fertility:

Date Eggs Desired	Date to Turn on Lights	
	Males	Females
Jan. 1	Nov. 1	Nov. 25
Feb. 1	Dec. 5	Dec. 25
March 1	Jan. 15	Feb. 1

(Dates suggested by P. H. Margolf, Pennsylvania State College)

Start giving lights to breeders gradually, the first day turning the lights on one-half hour before daylight and each succeeding day 15 minutes earlier until you reach 5:30 a.m., or early enough in the morning to give your breeders about 13 hours artificial light and daylight combined. A 25-watt or 40-watt lamp with a reflector is sufficient to light an area of 100 square feet.

Feed and water, the latter kept from freezing in winter by the use of electric heaters, should be available when the lights come on. A comfortable house or shelter will insure good fertility.

In large flocks of a few hundred or several hundred hens, use one tom per 13 to 20 hens, depending on the size of the birds. The larger the size of your birds, the fewer the hens per tom. In single-tom pen matings, use one tom per 10 to 20 hens, depending on their size.

The breeding stock must be

fed carefully balanced diets, especially with respect to protein supplements of good quality, certain vitamins and minerals. The diet should contain approximately 16.5 per cent protein, 6.5 per cent fiber, 2.4 per cent calcium, and 1.0 per cent phosphorus, 50 parts of manganese per million parts of the diet, 4,700 International units of vitamin A per pound of diet, 250 International units of thiamin per pound of diet, 1,400 micrograms of riboflavin per pound of diet and 450 A. O. A. C. units of vitamin D per pound of diet.

Livestock Production

Condensed from The Shorthorn World

Dr. A. D. Weber

Head of the Animal Husbandry Department, Kansas State College

Crop production has been expanded and its efficiency improved largely because expanding and increasingly efficient animal industries have provided dependable markets for crops and their by-products. The profitable utilization of pasture, forage and grain together with problems relating to efficient crop production, are the concern of livestock farmers. Their job is much more complex than that of farmers who specialize in the production of cash grain. It is a job that requires close attention twelve months of the year. Success comes with intelligent study and conscientious effort on the part of the individual farmer. There is no substitute for brains and hard work on a livestock farm.

It is important to recognize, too, that maximum efficient utilization of grass, roughages and grains is dependent upon systems of live stock production that are in accord with the productive capacities and conservation practices of individual farms and ranches. Difference in these capacities and practices reflect variations in rain-fall, soils, adapted crops, size of farms, markets and abilities of the operators. Consequently, there is a wide range of types of farming. Stability and prosperity result from widespread use of systems of livestock production which fit particular types of farming and have been adjusted to meet con-

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ditions peculiar to individual farms and ranches. Yet it is not enough to use adapted systems of livestock production. As I have already indicated, the human factor in livestock production is perhaps the most important factor of all.

A second factor of particular importance, is the supply of forage. Wide variations in feed supplies must be eliminated in order to have stability in livestock operations. Storing surplus feeds produced in favorable years will minimize the effects of drouths and crop failures. Permanent and temporary pastures properly managed also will help to give permanency to systems of livestock production by providing an adequate source of feed during most of the year. We should always remember that farmers are sometimes forced to reduce or even to suspend livestock operations entirely when feed crops are short or a total failure because of drouth. That happened in 1934 and again in 1936, with the result that in many instances there was forced liquidation at low prices.

On the other hand, it is not always advisable or even possible to step up livestock production in line with the maximum production of roughages in extremely favorable crop years. Experiences of farmers in the past decade prove conclusively that maximum cash returns from forages are obtained only when livestock production is stabilized. This can be done by the judicious use in lean crop years of reserve feed supplies carried over from years of abundant production. Silage will keep indefinitely if made properly and in semi-arid sections bundle feed will keep several years even when stacked in the open. It would seem, therefore, that at least a portion of the forages produced in good years might well be stored for use at some future time when feed is scarce.

A third major factor which influences net cash returns from forages is the efficiency with which these crops are produced. Success depends as much upon being a good crops farmer as it does upon being a capable livestock breeder. These two phases of successful farming are inseparable and it is tremendously important that a proper balance be maintained between crop enterprises and livestock enterprises.

A fourth major factor relates to financing the livestock enterprise. It is to be hoped that agencies financing livestock operations will study different systems of livestock production and arrange to adapt these systems to the needs of individual borrowers. Particular attention needs to be given to the fact that a long-time livestock program and hence

long-time credit arrangements are necessary to obtain maximum cash returns from pasture and forages. Both the borrower and lender need to do a lot of intelligent studying before a loan is made.

A closely related problem concerns the relationship between landlord and tenant. Longer tenure through equitable stock share leases offers the best way out and there is some indication that this type of livestock farming is increasing. In my opinion, landlord and tenant relationships with respect to livestock farming have an important bearing on the success of agriculture in a given region.

When cognizance is taken of the interdependence of these major factors and a system of livestock production has been adjusted to meet the needs of a particular farm and its operator, the stockman is still confronted with problems pertaining to breeding, feeding, management and marketing of the livestock. More experimental data are available on feeding than on breeding, management and marketing. It is likely, however, that in the years just ahead, much greater emphasis will be given to research in these fields than to feeding. Yet judgment as to the importance of new findings probably should be deferred until such time as it appears that the methods developed will be profitable under average farm conditions.

It is sometimes necessary to modify systems of production somewhat to conform to changed supply and demand factors, both for feed and livestock. Because conditions change, it is difficult to give specific recommendations that will fit any particular situation at some future date. It seems safe to predict, however, that if a farmer will select the system or systems of livestock production especially adapted to his farm, and does his part to see to it that the feeding and management are handled properly, the cash return for home-grown feeds will be satisfactory.

Heredity and Prepotency

Condensed from The Hereford Journal

L. M. Winters

Professor of Animal Breeding, University of Minnesota

THE terms, heredity and prepotency, are heard frequently when the problems of livestock breeding are discussed. They are important terms and have real significance for the livestock breeder.

Heredity refers to that something that is passed from parent to offspring and thus tends to make the offspring resemble the parent.

An individual's heredity is sealed at the time of fertilization. At that time a tiny egg cell about 1/150 of an inch in diameter unites with a sperm cell from the male, which is but a small fraction the size of the egg cell. This union of germ cells occurs a few hours after mating. Your new calf is then on its way and has already received all that it will or can receive in the way of inheritance from either parent.

The mother carries this new calf for about 270 days and during that time she, through her body, shelters and feeds the new calf. Following birth she protects and continues to feed the little fellow. To this extent she plays a larger role in getting the calf on his way toward being a great individual, but she does not give him any more of his heredity.

Prepotency refers to the ability of one parent to stamp its characteristics on the offspring to a greater degree than the other parent. This may sound like a contradiction of the previous statement that the two parents contribute equally to the new individual's heredity, but it is not, as is brought out later. Since prepotency refers to the ability of one parent to stamp its characteristics on the offspring at the expense of the other parent, it is of great economic importance, especially in a herd sire. The herd sire that sires a uniform crop of calves is the prepotent one—and the valuable one, provided the calves are superior.

Some races (breeds) are more prepotent than others. This shows up in crosses, for when breeds are crossed there are some breeds that tend to leave their stamp at the expense of the other breed. Such a breed is spoken of as a prepotent breed. I am not writing of the more superficial traits such as color, type or hair-coat,

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etc., but of the characteristics that make animals really worth while. The Leicester breed of sheep appears to be such a breed. I have observed many crosses wherein the Leicester was used and I have yet to find a cross in which the Leicester did not leave his mark at the expense of the other parent.

Prepotency is inherited and in turn it is the hereditary material the parent passes to the offspring that is responsible for the parent's degree of prepotency. Heredity and prepotency have much in common. The tiny egg cell contributed by the dam to the new individual isn't just a tiny particle of something or anything; it has a definite organization.

In this egg are chromosomes, in the case of cattle there are 30, no more and no less. Let's picture these chromosomes as small rods, say toothpicks, only pretty small ones. These small rods carry still smaller particles called genes and we can think of them as small heads on the rods located one behind the other. The genes are the actual hereditary units. They determine what the individual can develop into; a calf or a pig, a Hereford or a Jersey, a good Hereford or just a Hereford, etc.

The sire contributes a germ cell to the making of this new individual. His germ cell like the one from the dam also has (in cattle) 30 chromosomes. Each one of the 30 has a mate in the 30 found in the mother's germ cell.

These chromosomes, like the one from the dam, also have genes. Their genes are mates to the genes contributed by the dam. Let's get this picture straight because it is important. Let's think of a certain chromosome pair. One member of the pair came from the dam and the other from the sire. Each chromosome we will say carries 50 genes. Now let's think of our little rod carrying 50 little beads one behind the other. Each gene or bead has its mate in the chromosome mate, so if one member of a pair has 50 genes the other one has 50 genes and each of these genes is paired to a gene contributed by the other parent.

A member of the gene pair is responsible for one or several expressions in the new individual. A certain gene is responsible for white face in the Herefords. Its mate brought in by the other parent may also carry white face, in which case our calf is not only white-faced but it is pure for white face. The other gene may not carry white face, but a colored face. In this case our calf will be whitefaced because white face is what is called a dominant character.

In this respect the Hereford parent is the prepotent one, for

it has stamped its white face on the offspring at the expense of the other parent's colored face. From this, it then becomes clear that the individual that possesses a large number of dominant traits is going to be the dominant parent with respect to those particular traits.

The polled condition is another dominant trait. A pure polled individual mated to a horned individual will leave the offspring polled. But because an individual is dominant in one respect is no sign that it is dominant in others. It may be dominant in others or it may not.

A second factor in prepotency is purity of germ plasm. The more nearly pure the heredity for dominant traits the greater the degree of prepotency. We will return now to our whitefaced bull mated to a colored-faced cow with the resulting white-faced calf. We will assume that the whitefaced bull was pure for white face, in which case we can represent him as WW with respect to white face. He is WW because both genes affecting face color cause white. The calf he sired out of the colored-faced cow is Ww, because the calf received only one W, the small w for colored-face came from his mother.

Now when this calf grows up and produces germ cells he will produce one germ cell carrying W to every germ cell that carries w. In other words one-half his germ cells will carry the W for white face and one-half will carry w for colored-face. This calf is not as prepotent as his sire, because when mated to a group of colored-faced cows his sire would leave all white-faced calves and he, the son, will on the average leave only one-half white-faced calves. The same point could be made with the polled condition. We therefore have two conditions that make for prepotency; one is the possession of dominant traits and the other is genetic purity for those traits.

We used to hear more about sires that would "breed on-and-on" into succeeding generations. I expect the reason we hear less about this is because it isn't so and that fact is becoming more generally realized. It is impossible for a sire to "breed on-and-on" into succeeding generations with continued prepotency.

Our white-faced bull is WW. When he produces a germ cell only one W is put in the germ cell. He is used on a colored-faced cow so the new calf receives a W from the sire and a w from the dam. When he produces germ cells one-half carry w for color. The ability of our old sire to breed on-and-on with continued prepotency is already badly shot.

Since prepotency is a definite

asset to the individual animal, to the herd or to the breed, the question arises how can prepotency be bred in the individual, herd or breed? The answer to that one is careful selection for worthwhile traits coupled with inbreeding. Inbreeding is the mating of individuals that are more closely related than the average of their breed. By inbreeding we encourage genes that are alike to come together.

At this point we will do well to think of other traits as well as white face and polled. Let us think of size, rate of growth, vigor, fertility, etc. Most, likely all, of these traits are affected not only by one pair of genes but by many pairs of genes. The problem becomes more complicated, but let's not make it too hard, because we can think it through in rather simple terms.

When we mate related individuals we are more likely to bring like genes together. By so doing we promote genetic purity; we bring out what is in our stock. Then if our selection is careful we can use inbreeding to advantage in obtaining what we are after.

I like to think of inbreeding as a powerful motor boat and selection as the rudder with which we direct the course of the boat. But again we must not ask the impossible of selection. We can do no more with selection than the germ plasm we are working with will permit. Let us think of germ plasm as comparable to the water our boat is in; if the water is a large lake our latitude is wide, if it is a narrow stream our latitude is extremely limited. And so of our possibilities with selection.

If the germ plasm we start with has but little in it that is good we can't get much good out of it. We can't make genes by selection, all we can do is pick out the ones we want in our herd of the future. As we inbreed we limit selection still farther, because the more highly inbred our stock the greater the degree of purity so the less the opportunity for change by selection.

If I were given the job of developing a highly potent herd I would go at it as follows: I would first decide in what respects I wanted them to be prepotent. And if I had the choice I would give useful traits, such as hardihood, fertility, thickness of muscle, etc., first call. Then I would do the best I could to obtain animals that possessed those traits. And the third step would be to inbreed, accompanying the inbreeding with very careful selection for the traits I was after.

I wouldn't make many full-brother-sister or sire-daughter matings but I would make a lot of half-brother-sister and uncle-

niece matings. In my opinion this combines speed of purification and a certain degree of caution at about the optimum levels. Yet I am free to admit that I can't prove this is the optimum level of inbreeding.

If we carefully review the work of some of our great breeders of the past we will find that most of them followed this general pattern. If outcrossing had been adhered to Anxiety 4th would not fill so many places in Hereford pedigrees as he now fills. These old breeders worked these things out in their own way (and all the more credit to them); the science of genetics was not available until recently.

In the light of the information available today, it is quite clear that more progress might have been made if more inbreeding had been used. On the other hand, less might have been accomplished because unless the work was done carefully some things might have been lost that were gained by the outbreeding. We must never think of inbreeding as a "cure-all," it is merely a tool that can be used constructively or destructively. The hoe is a good garden tool, but we can hoe out the potatoes and leave the weeds or we can use it to take out the weeds and leave the potatoes. And so with inbreeding. We can use it to advantage provided, of course, we have something worth while to use it on; or we can use it, as the hoe, destructively.

When we use inbreeding constructively, we build genetic purity and when we build genetic purity we promote prepotency. If we want prepotency in our herd then we must have a high degree of purity. The purity will, of course, be more effective if the purity is for characters that are dominant.

Now then, what of the records of sires without inbreeding that appear to have "bred on-and-on." The breeder that has an outstanding bull will try to mate him to outstanding females. A superior calf crop should result and one, or several of the bulls should prove to be good sires which get used on superior females. Again we have a superior calf crop, or several calf crops. A bull or several bulls are used on outstanding herds and again some good calf crops are obtained.

The result of all this is that if we review the record it appears that the old bull "bred on-and-on." He appeared to do this because he and his son, or sons, and his grandson or grandsons, were used on outstanding females. As a result the females put as much good in the offspring as the sires. The old sire's genetic contribution couldn't help but become thinner and thinner with each succeeding generation,

yet he appeared to "breed on-and-on" because of the merit of the females with which he and his sons and grandsons were mated.

Prepotency is a valuable trait. It means dollars and cents. It can be bred in a herd or a breed. It is dependent on the possession of dominant traits in a high degree of purity. Rigorous selection toward a given goal when accompanied by inbreeding is the only method I know of whereby a herd, line or breed can be developed for prepotency.

Dry Land Duck Farming

Condensed from the Rural New-Yorker

Dale H. Fife

THE Reichardt Duck Farm at Colma, California, is a record breaker from the standpoint of the number of ducks raised per square yard of space. On the 18 acres of dry land used for this purpose the Reichardt brothers go about their business of raising one million pounds of Grade A Imperial Pekin duck annually, bringing them to market age in record time.

They consider the prime requisites for successful duck raising: cleanliness and feed quality, coupled with patience and attention to minute details. They blend new ideas with the breeding and feeding formulas developed by their father, who founded the business at the turn of the century, and who was a pioneer dry-land duck farmer. The feed consists of such grains as barley, oats, rice and corn; these are ground and mixed with crisp, freshly minced greens. To this, commercial forms of vitamins A and D are added, also protein feed such as meat scraps, fish meal, or soybeans. This mash is then heaped in small cars which are trammed via overhead rails to the duck pens.

If ducks are allowed to eat at random their eggs naturally tend to have a strong taste; but when fed a balanced ration, the eggs have a rich flavor which can hardly be called strong. As a result, many people will eat no other kind.

The capacity of the incubators used at the Reichardt farm is over twenty thousand eggs. The eggs are held at a constant temperature of 103 degrees for their entire incubatioin period of 28 days. During that time they must be turned several times each day. After five days in the incubator, the eggs are candled, at which

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time infertile and cracked eggs are removed.

In the brooder room charts of the progress of each unit are kept. The ducklings are kept in the brooder for 10 days, the temperature being gradually reduced. At first, canvas flaps, resembling small awnings, are lowered in front of the covered section of the pen. By degrees these are lifted to allow more air to circulate; the ducklings soon learn to take advantage of the uncovered area and to find drinking water which flows in a constant stream in front of their pen. The mortality rate during this period is less than 10 per cent. By the time the ducklings are two weeks old, they boast a sturdy frame, a strong walk and carry their heads proudly. Even though ducks have not been near open water for generations, their offspring are born with the knowledge of swimming. No matter how young, a duck will swim immediately if put into water, although in about 10 minutes he starts to flounder and sink decause his soft down coat is not as water repellant as the feathers he will grow later. Also, since he is an incubator baby, the mother duck is not on hand to restrict his natural tendency to dive and cut water capers, and teach him how to waterproof himself by oiling his feathers with the contents of the sack just above his tail.

The pens where the ducks are put after 10 days in the brooder are larger and the ducks can move at will from their sleeping rooms to the outside pens. All floors, both inside and out, are concrete and can be hosed off. No new batch of ducks is moved in until the quarters are rested, aired and disinfected. When one considers that each acre of this land produces an average of eleven thousand ducks per year, the high degree of sanitation attained by the Reichardts is therefore no small feat.

As the ducks mature, they are moved to other quarters until finally they reach market age. They start losing their yellow fuzz at three weeks and begin to grow feathers. This is the "ugly duckling" stage. The ducks are marketed before their pin feathers develop, which is about 70 days. When the Imperial Pekin duck reaches maturity, it has a plump white body, a long graceful neck, and holds its head proudly.

An experienced duckman can estimate the age of a duck by the sound it makes. The newborn duckling has the high pitch of a small child, at four weeks the scratchy voice of the adolescent, and at six weeks finally develops the quack. The drake, on the other hand, never gets anything more than a hoarse sound out of its throat. It is easy to tell if a duck is happy or unhappy also by

the sound it makes. When a duckling is unhappy he lets out a sustained "p-e-e-p." He shows his happiness by short peeps; chuckles perhaps.

The yards used by the laying ducks are larger than those for the market ducks and they are the only ones not concentrated. The laying stock are the pick or the breed. While a market duck weighs six to six and one-half pounds, the laying stock, being older, weigh up to eight pounds. Only a small percentage of the ducks produce enough eggs to be kept for a second year.

Lights are kept burning at night, not to force egg production, but to keep the ducks from becoming frightened. The slightest noise will cause them to go into a panic, which spreads from yard to yard until there is a regular bedlam.

During the course of the year thousands of tons of duck manure are trucked away to be sold to local vegetable farmers. The duck feathers are ordinarily sold to a San Francisco mattress factory. The freezing plant is used when the duck farm is on a normal production basis. At the present time, most of the ducks are sold alive to the markets in San Francisco's Chinatown, duck being a favorite food of the Chinese; the tender ducks for barbecuing are very popular.

The Reichardts employ the more expensive method of dry-picking their ducks. Instead of plunging them into scalding water, they are chilled to near freezing. Women pluckers average about five ducks in one hour. Dry-picked ducks retain their natural cream-white color and can be kept in the refrigerator without freezing for several weeks.

Harvesting the Timber Crop

Condensed from The Michigan Farmer

Marshall Sayles

YOUR standing timber is an ever-present source of revenue that's constantly earning you a good rate of interest, and sound management will bring the greatest returns.

Leading farmers are considering their trees as a crop, and the wood is being harvested accordingly. That's the basic thought in this new forestry program—Wood is a crop. It is as much a crop as wheat, corn or tomatoes. Like common farm crops it must be harvested at the right time in order to bring greatest return to the owner.

The main difference between your trees and your annual crops is the growing period. There is a span of years in the life of a tree from the time it is ripe to the time it begins to lose value through excessive rot. This is an advantage to you. It allows you more time to adjust harvest periods in relation to good marketing conditions.

By practicing good forestry, woodlot owners cut only those trees which do not justify the space they occupy in the stand. They leave trees that are well-shaped, vigorous and making good growth.

A tree's life is comparable to your own. It passes through the stages of infancy, youth, maturity, old age, and decadence. Its period of greatest growth is just before maturity.

T. E. Daw, in charge of the State Conservation Department's private forestry operation program, gives some interesting facts about the life of a Michigan tree.

The average tree will reach a diameter of 12 inches and a salable log length of 16 feet in 60 years. It will grow about two inches in diameter every 10 years. At 70 years it will be 14 inches in diameter and have about 24 feet of merchantable log length. According to the Doyle Log Rule, it would contain 29 board feet at 60 years. This would increase to 66 board feet at 70 years. With standing timber at $20 per thousand board feet, the tree is worth only 58 cents at 60 years. But it would be worth $1.25 in the next 10 years.

Let's compare these figures on an annual basis. The tree increased in value at an average rate of less than one cent per year for the first 60 years. But during the next 10-year period, the annual increase was over seven

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times as much—7½ cents per year; 12 and 14 inch trees are just starting to make money for their owner. Between 90 and 100 years the increase is 15 cents per year. You had better think about that, the foresters say, before harvesting trees less than 20 inches in diameter.

According to the foresters, the woodlot owner should decide how often he wants to make a cut. He must remember that the shorter the time between cuttings and the more work he does in the woods himself, the more money he'll make. Here's where the farm forester offers worthwhile help.

He consults with the owner. Together they consider all factors in determining how the woodlot can be best managed. They consider the age and condition of the woodlot; the best land use; future needs of the land-owner for timber products or cash; the available markets; the price and demand for forest products. The forester then advises on management practices, estimates the volume, assists in marking trees to be cut, helps you sell stumpage, logs, pulpwood, posts and fuel wood.

The service is also available to give advice on protecting woodlands from fire, insects, disease, and grazing. The greatest harm done to farm woodlots is grazing. The use of windbreaks, soil erosion control through forest planting and wildlife management are a few additional helps. The forester's knowledge and experience, together with that of cooperating agencies, are available to farmers and sawmill operators. For the millman he'll help improve efficiency, make high quality lumber, and regain local markets.

Now that he is in the field to help, Michigan woodlot owners can little afford to be without the farm forester.

Farm forest districts in southern half of the lower peninsula are now well organized. The service is available in all counties. State forestry affairs in the northern half of the lower peninsula and in the upper peninsula now are being reorganized. It is expected that eventually consulting service to woodlot and small timberland owners will be extended into these areas.

Here's what to do if you need help. Contact the nearest farm forester. State your problem clearly. Explain the service you desire. Give the legal description of your land. The forester might want to consult airplane photographs or soil maps before he visits you. Farmers are also advised to contact their county agricultural agents on forestry matters.

The new program writes the final chapter to Michigan's lumber scandal. Those tragic years

of careless slashing, burning and non-reforestation have come to an end. But they have left the once greatest lumber producing state in the nation nearly "wood-poor." It's being consumed faster than it grows. We now are importing more than half of all the wood we use.

Pen Barns Have Certain Advantages

Condensed from The Dakota Farmer

FOUR years of investigation by the University of Wisconsin show that pen-type barns have some worthwhile advantages over standard barns. On the other hand, pen barns also have shortcomings, some of which may be minimized or eliminated through further research.

This general summary of findings to date devoted largely to dairy husbandry rather than engineering phases, is based on reports by E. E. Heizer, George Barrett, I. W. Rupel, and Ernest Zehner, who have conducted the investigation in Cooperation with engineer Stanley Witzel.

Perhaps the most striking feature of the investigation is that it has not borne out the misgivings which farmers most often express concerning pen barns. This is partly because some of the supposed disadvantages of a pen barn simply do not appear to exist, and partly because some of them have been countered by planning and management designed to head off the usual pen-barn difficulties.

For example, the men conducting the investigation are often asked whether cows do not step on one another in the loose-run pen barn. That has never happened so far; no teats or udders have been injured in this manner in the pen barn.

On the other hand, many teats have been injured during the same period in the stall barn used for comparison. It is not known whether the stall-barn cows sometimes step on each other, even though the stalls have partitions, or whether the animals injure their own teats when getting up.

In other respects also the pen-barn cows have been exceptionally free of injuries. Presumably because they lie on a soft, warm manure and bedding pack, they have never shown a case of hock swelling, stiffness, or lameness. In the University stall barn, as on most farms where cows lie on concrete, there has been a good deal of trouble on these counts.

Whether the type of barn has

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any effect on mastitis is a question which cannot be answered conclusively as yet. It is possible to say, however, that pen-barn cows at least have not shown more mastitis than those in the stall barn—in fact, what difference has been shown up thus far favors the pen barn.

Another objection which dairymen often raise against pen barns is that there is apt to be trouble with "boss" cows. There has been no such trouble in the University trials. The fact that it has failed to come up thus far does not prove, of course, that it cannot or will not. Farmers who have tried pen barns have reported this type of difficulty in some instances.

Although, naturally, proof is lacking as to just why there has been no trouble with boss cows at the University, it seems likely that these points are factors:

First, all the cattle are dehorned.

Second, the feed bunk was especially designed to discourage boss cow activities around it. The feed bunk can be an important factor in this connection because, with bunks of some designs, a boss cow often places her head in the bunk and then charges alongside it to drive the other animals away.

The feed bunk used in these trials is only as long as it needs to be, supplying about 30 inches of space for each of the big Holsteins in the herd. Since there is no open space along it when the animals are feeding, there is little opportunity for one animal to get a running start in charging the others from one side. Another feature of the bunk is that it has cross-bars nailed across the top from front to back about five feet apart, so that a cow with its head in the bunk cannot move far to the side without backing out.

That milk production can be good in a cold, uninsulated pen barn is clear from the record so far. There has been little difference in the production of a herd kept in such a barn, compared with that of another in a warm stall barn. Reversing the herds indicated that what difference there was to a large extent was associated with the producing ability of the herds rather than with the type of barn.

Many people have been skeptical whether it is possible to obtain high-quality clean milk from a herd kept in a pen barn where the manure is removed only once or twice during the winter. It is certain now that this is possible, but only if bedding is used very liberally.

The fact that a pen barn requires an exceptionally large amount of bedding is one of its disadvantages. It should not be a serious matter on farms with a surplus of straw or corn fodder,

but can be very objectionable where bedding is scarce or has to be purchased.

Recently it has been found desirable to use at least three times the normal amount of bedding in the pen barn. Specifically, about 300 pounds of bedding is used daily for a 15-cow herd, compared with 85 to 100 for the same size herd in the stall barn.

The pen barn saves a substantial amount of time on barn cleaning, for it is cleaned only once or twice a season, and then with the aid of a tractor manure-loader. It takes far more time to clean the stall barn by hand every day, and indications are that it would take more time in the stall barn even if it were equipped with a mechanical gutter cleaner.

There are two important points to bear in mind as to cleaning a pen barn. First, if manure is to be removed in mid-winter, it is best to leave at least some, because the cows are accustomed to the warmth of the heating manure pack when lying down. Second, if manure is to be removed only once a season and a tractor loader is to be used for the job, it is desirable to have a barn with 10 or 12 feet of head room, since the manure will pile up to considerable height over a period of five or six months.

Keeping the water tank from freezing has not been a serious problem under the university set-up. The tank is small, insulated with shavings, and equipped with a float to let in more water whenever the cows drink. The tank is also provided with an overflow, so that in sub-zero weather the water can be set to run a little at all times. There is practically no freezing even in the coldest weather when this is done.

Neither has there been any important amount of trouble in getting cows to come from the pen barn into the milking room, for the simple reason that the animals line up voluntarily because they know they are going to be fed at milking time. New cows usually learn to line up in three or four days.

The pen barn and milking parlor system did run into a complication when fast milking was introduced. Cows no longer had time to eat their feed in the time it took to milk them, where two men and two milker units were used in a 4-cow milking room.

To get around this difficulty, the university enlarged its milking room to hold eight cows at a time. This is practical for large herds, but would increase overhead costs too much in small ones.

It is possible to get along very well with a 4-cow milking room if only one man and one unit are used. Indications are that it may

also work well enough to have a 6-cow milking room where two men and two units are employed, but from the standpoint of getting maximum efficiency from the labor of two men there probably is some advantage in having two more stalls.

More research needs to be done on the design and operation of both pen barns and milking parlors. The system has some indisputable advantages and, everything considered, is reasonably satisfactory as used at the university now, but there should be possibilities of improving it further.

He Grows $1,000 on Each Acre

Condensed from New Jersey Farm and Garden

John F. McDonald

THE Sinclair farm in Vineland, N. J., is unusual; it's measured in feet rather than acres. But there's nothing undersized about its production or its income.

It is a high-production Cumberland County truck enterprise with an overall size of 210 by 1,036 feet. That makes just a shade under five acres—and the house, packing sheds and barns are included in that grand total.

But Andy Sinclair took close to $4,000 in cash crops out of those four irrigated, triple-cropped, production acres. And he has his plans made, his cover and green manure crops sown, his machinery already overhauled for an even bigger season next year.

An even bigger season isn't out of the question because the former owner (who also served as Sinclair's teacher), Battista Capra, averaged close to $5,000 from the five acres during the 22 years he operated the farm. So well did he operate it, in fact, that Capra retired at 45.

Sinclair hopes he can do as well, and with a full season of high-pressure truck cropping behind him, the 33-year-old veteran of the Normandy invasion figures he's done "better than average—better than I hoped to do."

The five acres of light sandy loam were bought with a farm ownership loan through FSA—the first one made, incidentally, to a New Jersey veteran.

It's located on a quiet suburban city street, so un-farm-like that a city truck picks up the garbage, and city mains carry gas and water.

Out back are packing sheds, machinery and tool sheds and even a stable for a horse, which

Reprinted by permission from N. J. Farm and Garden, Sea Isle City, N. J., Dec., 1946

is the only "livestock" on the farm.

In one packing shed squats the sturdy Ford Model A motor that drives the pump which draws the lifeblood of the business—irrigation water—from a four-inch well.

Power for cultivation and other farm operations comes from a cutdown doodlebug tractor—another Ford gone wrong—a light garden tractor, and the single horse.

Outside the "garden" stretches back for a thousand feet, neatly cut into one-sixth-acre plots by the fence-like structure of the fixed overhead irrigation system. Two-inch lines carry water to the laterals and tapering 1½ to 1-inch pipes do the squirting. Brass nozzles set into the overheads at 3-foot intervals provide the necessary fine spray and a lever can twist the overheads to direct the spray to either side or at any angle. The system can deliver 700 gallons per minute.

By November, with all crops in except a sixth-acre of endive and a like amount of red-hot "cherry" peppers, most of the farm is carpeted with a sturdy growth of soybeans and hairy vetch to be turned under next year.

At the far end of the tract lie four large "beds," a full acre, of dandelions, green and sturdy. They will be cut in March and April to furnish the first cash crop of next season. Those beds will then be planted to spinach, forced and cut by late May. Leeks will then be put on the same acreage and cut by October. That's how Andy Sinclair farms an acre of ground.

Besides the leeks, spinach, dandelion greens and peppers, Sinclair's 1946 program included the sixth-acre of endive, a quarter-acre of radishes, an equal acreage of broccoli, a fifth-acre of string beans, an acre of lettuce, an acre of carrots, a half-acre of beets, two-fifths of an acre of cucumbers, and a quarter-acre of parsley.

The parsley is typical of many of Sinclair's crops. His first cutting from the "bed" of parsley yielded 253 bushels and through careful judgment and timing went for $2 per bushel at the Vineland Auction Market. Later cuttings increased the yield, but the biggest and most important batch—the first one—brought the highest price.

In late October, Sinclair was fighting frost as he awaited a rising market for his four-fifths of an acre of cherry peppers. The shelterbelt of brush and trees helps keep the farm at a slightly higher temperature than those of neighbors, but Sinclair's ace in the hole is early morning irrigation.

At three o'clock in the morning

watering, just when the temperature reaches its lowest and most damaging point, raises the air to the warmth of the water and can stave off frost. Keeping the peppers free of frost damage gives Sinclair the latest fresh crop in the section—and at a premium price.

But taking $1,000 an acre from the soil calls for long, hard work. At the time of year when most farmers are through their year's heavy work, Sinclair and his wife still must harvest their last two crops and then there lies ahead the annual job of painting and glazing the hotbed sash.

Former-owner Capra taught Sinclair that sash should be taken care of each year. "He was right," says Andy. "These frames were built 37 years ago and they're as sound and as good today as the day they were built."

Long before most farmers start work in the spring, Andy will already have taken off his dandelion crop, an early specialty that last year yielded him a profit of well over $500 before the season really started. That crop let him start the season with a big payment toward his containers and other overhead costs. Once again the light soil and the sheltered position of his acres worked hand in hand with an ambitious and hard-working young man to return a tidy profit.

Sinclair saves his own seeds for some crops and grows his own plants in the sterilized soil of his quarter-acre of hotbeds.

Next year will see the start of a small poultry operation on the Sinclair farm. Housing for a good-sized flock is included on Andy's winter plans and he will start a "couple of hundred" heavy birds early next spring.

Aside from the income from the birds, their droppings will furnish valuable fertilizer for the farm itself. At present, poultry-keeping neighbors furnish all that is necessary. By using natural manure and the soybean-vetch combination, Andy's fertilizer bill probably will not run much over $150 for the year, abnormally low for the high-pressure truck cropping business.

Sinclair's first year found him exceeding the plans he had worked out with County FSA Supervisor Rene Gossiaux by about 25 per cent. This was in spite of his inability to get the poultry enterprise in operation as he had hoped. His net profits are high, since expenses are limited to farm and home necessities, labor coming exclusively from Sinclair and his wife.

"It's hard work," Sinclair admits. "My wife and I put in about 100 hours of work—hard work—each week from April to October. But it's worth it to us. We're on our way to independence and security on a farm of our own."

Hand Picked Sheep Boost Wool Yield

Condensed from Capper's Farmer

A SPEEDY method of culling sheep that increases wool yield is widely practiced in Wyoming. It is adapted to large bands and is reasonably accurate. Some remarkable increases in average fleece weights have been made where the method has been followed persistently.

A notable example is the Warren Live Stock Company in Laramie County. Fleece weights have increased 3 pounds in 15 years. In view of numbers involved 40,000 to 50,000 head annually, that approaches mass improvement.

Dean J. A. Hill, of the Wyoming College of Agriculture, records many other comparable cases. For example, in a Big Horn Basin flock of 10,000, the average clip went up 2½ to 3 pounds a fleece in 5 years.

The method of culling was developed by Dean Hill. As wool specialist for the experiment station, he attended shearings and examined fleeces. He was looking for a speedy and reliable method of judging not only wool yield and quality but also body conformation. After handling thousands of sheep and weighing their fleeces, he became convinced there was a correlation between the "feel" of covering, the quality of wool, the weight of the fleece and the animal form.

Flockmasters and sheep husbandmen long have recognized the relationship between wool and body type. But they had no easy way of determining it. The old method of handling every animal, parting the wool at key places, spanning the loin, palming the rump and shoulder, grasping the leg o'mutton, poking the saddle and barrel was a time-consuming process. It was too slow for large numbers.

Hill made 3 distinct contributions to effective mass culling. First, was his discovery that a sheep's back is an indication of productivity. It's breadth and covering are a fairly reliable key to the other scorecard points. Second, was development of a speedy system of handling sheep in large numbers. A firm grasp of the upper loin region reveals type and quality. He became skilled in judging fleeces and form as the animal passed him in a chute. The sensitiveness of his hands and fingers told him which were good and which were poor. His third contribution was the ability to teach others how to cull by this method. It is so simple that they learn readily.

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"It's not a perfect system," said Dean Hill, "but it is practical. Anybody who has normally good judgment and knows sheep can learn to take out the poorest fourth or third after handling about 500 head. An experienced man will run 1,000 or more in an hour. And if we don't show at least 1 pound difference in fleece weights between culls and selects after they are sheared, we don't consider it a good job."

Usually the difference is greater. The initial demonstration was held in Martin Baskett's flock, Natrona county, just before the first World War. The sheep were separated and then sheared. Fleeces of the group selected for breeding were 3 pounds heavier than those of the culls.

"The ewe is not only the mother of the next generation, but she is a living producer in this," said Dean Hill. "That double function is the basis of our culling. Suppose I have 3 ewes that shear 12, 9 and 6 pounds respectively. If for any reason I sell the first, and retain the last, I get a reduction in average fleece weight the next shearing. I also perpetuate the lighter fleece weight and the poor type of the 6-pound ewe. But if I select the first 2 and discard the third, I raise the fleece weight average for the next shearing and perpetuate better production of both wool and mutton by breeding the top ewes."

In demonstration culling, the Wyoming specialists first ask the flock owners how many ewes they can spare. The percentage may range from 10 to 30, depending on condition of flock, pasture and feed reserves, market demand. Specialists recommend 2 cullings —the first in fall, which the owner may do. He retains a safe margin. If he is skilled in the Hill method he will cull closer than if he merely eliminates the obviously undesirable. The culls are sold with the wether lambs. Those retained are held until spring when the surplus ones are eliminated. Many flockowners also run over their 2-year-old and older ewes as a means of facilitating the improvement.

For small lots a holding pen is satisfactory, but in quantity working a narrow chute is constructed through which the sheep are run. The culler stations himself where he can make a quick feel of each animal. A helper marks those that are to be discarded.

The speed with which culling can be done is revealed by Dean Hill's notebook. He and N. L. Dahlquist, Carbon County agent, handled 30,000 for the Cow Creek Sheep Company in 3 days. Another item shows 9,926 culled by 2 workers December 5; 7,986 December 6, and 8,856 Decem-

ber 7. This last lot was worked in 4 hours, or at the rate of more than 1,100 an hour per man. During 7 years Dean Hill culled 10,000 to 15,000 a year for the Warren Company. Last spring, his book shows 44,000 culled for various owners during the season, and Anton Fellhauer, livestock specialist, handled at least as many. The number is not exceptional, ,but rather representative of the culling done for several years. Many more were culled by county agents and by owners who learned the method through demonstrations, wool schools and short courses. For the whole state, totals become impressive. Undoubtedly wholesale elimination of low producers from breeding flocks has been a factor in making the Wyoming 10-year average fleece weight the nation's top. For the 10 years which ended in 1937, Wyoming fleeces averaged 9.3 pounds, while those of Montana averaged 9.4. Both states were up for the decade which ended in 1943. But Wyoming was leading with 9.6 to Montana's 9.4. Since the trend in Wyoming has been steadily upward, Dean Hill thinks a fraction of a pound for a 10-year period indicates results from the improvement program.

But it is in individual flocks that the big showing is made. Under the method average fleece weight is increased immediately by eliminating low producers. For the long-time improvement it is increased by breeding only the top producers. The same process improves wool and carcass quality.

GOOD READING

SUCCESS ON THE SMALL FARM—By Haydn S. Pearson, author of "Country Flavor."

This book offers a specific and practical program for making a profit from a one-man farm of ten or twelve acres. It is addressed to the beginner with limited capital who must make a safe and efficient start. Established farmers will find much valuable information and sound advice in this book.

Publisher: McGraw-Hill Book Company, Inc. $2.50.

PLEASANT VALLEY—By Louis Bromfield, farmer, soil conservationist, and author.

This appealing and delightful book is written for everyone—city-dweller or country man. It is an engaging account of the author's experiences as a farmer in his native Ohio, telling the story of the land and people who are closest to him.

Publishers: Harper & Brothers. $3.00.

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

A Living from Bees—By Frank C. Pellett, Field Editor of American Bee Journal. Orange Judd Publishing Co., Inc. $2.25.

Animal Sanitation and Disease Control—By Dr. R. R. Dykstra, Dean, School of Veterinary Medicine, Kansas State College. The Interstate Printers and Publishers. $3.50.

Beef Cattle Production in the South—By D. W. Williams, Head, Department of Animal Husbandry, A. & M. College of Texas, College Station, Texas. The Interstate Printers & Publishers. $2.50.

Breeds of Livestock in America—By Henry W. Vaughan, formerly Prof. of Animal Husbandry, Iowa State College. College Book Co. $4.75.

Dairy Cattle Feeding and Management—3rd Edition—By H. O. Henderson, Prof. of Dairy Husbandry, W. Va. Univ., Carl W. Larson and Fred S. Putney. John Wiley & Sons, Inc. $4.50.

Dairy Science—By W. E. Petersen, Ph.D., Assoc. Prof. Dairy Husbandry, Univ. of Minn. By R. W. Gregory. J. B. Lippincott Co. $4.00.

Diseases and Parasites of Poultry — By Edgar Hugh Barger, D. V. M., Berkeley, Calif., and L. E. Card, Ph.D., Prof. of Poultry Husbandry, Univ. of Illinois. Lea & Febiger. 3rd Edition. $3.75.

Farmers of the World—The Development of Agri. Extension—edited by Edmund deS. Brunner, I. T. Sanders, Douglas Ensminger. Columbia Univ. Press (1945). $2.50.

Farm Management—By Robert R. Hudelson. The Macmillan Co. $2.50.

Farm Records—by John A. Hopkins, Ph.D., Asso. Prof. Economics, Iowa State College. Iowa State College Press. $3.00.

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $6.00.

Forestry in Farm Management—By R. H. Westveld and Ralph H. Peck. John Wiley & Sons, Inc. $3.50.

Grow Your Own Fruit—By M. G. Kains, formerly U. S. Dept. of Agri.; Prof. of Horticulture, Penna. State College. Greenberg, Publisher. $3.50.

Hatchery Management—By Roland C. Hartman, Editor, Everybody's Poultry Magazine, and G. S. Vickers, Field Mgr., Ohio Poultry Improvement Asso. Orange Judd Publishing Co., Inc. $4.00.

How to Raise Rabbits for Food and Fur—By Frank G. Ashbrook, Fish and Wildlife Service, U. S. Dept. of the Interior. Orange Judd Publishing Co., Inc. $2.00.

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $3.00.

Livestock Production—By Walter H. Peters, Chief, Div. of Animal and Poultry Husbandry, Univ. of Minn. McGraw-Hill Book Co., Inc. $4.00.

Livestock Judging Handbook — By Julius E. Nordby and W. Malcolm Beeson, Ph.D., Asst. Professors Animal Husb., Univ. Idaho. The interstate Printers. $3.25.

Making Pigeons Pay—By Wendell M. Levi, formerly Pigeon Section, U.S.D.A. Signal Corps. Orange Judd Publishing Co., Inc. (1946). $2.50

Modern Agricultural Mathematics—By Maurice Nadler, B. S., A. M., Dept. of Mathematics, Newtown High School, Long Island. Orange Judd Publishing Co., Inc. $2.00.

Modern Farmers' Cyclopedia of Agriculture—By Earley Vernon Wilcox, Ph.D., formerly U. S. Dept. of Agri. Orange Judd Pub. Co., Inc. $4.50.

Natural Principles of Land Use—By Edw. H. Graham, Chief of Biology Div., Soil Conservation Service. Oxford University Press. $3.50.

Onion Production—By Donald Comin, Ass't Horticulturist, Ohio State Exp. Station. Orange Judd Publishing Co., Inc. (1946). $2.00.

Pay Dirt—Farming and Gardening with Composts — By J. I. Rodale. Devin-Adair Co. (1945). $3.00.

Pork Production — By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. The Macmillan Co. $4.15.

Poultry—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry. Mo. State Univ. J. B. Lippincott Co. $5.00.

Practical Farming for the South — By Benjamin F. Bullock, now Prof. Rural Education, Atlanta Univ. Univ. of North Carolina Press. $2.50.

Profitable Poultry Keeping—By H. Clyde Knandel, Head, Dept. Poultry Husb., Penn State College. Orange Judd Publishing Co., Inc. $3.00.

Repairing Farm Machinery—By Ivan G. Morrison, Asst. Professor Agri. Education, Purdue Univ. The Interstate Printers & Publishers. $2.25.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Book Co., Inc. $4.50.

Soil Conservation—By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Dept. of Agric. McGraw-Hill Book Co., Inc. $6.50.

Starting Right with Turkeys—By G. T. Klein, Extension Poultryman, Mass. State College; edited by Ed. Robinson. The Macmillan Co. (1946). $2.50.

Successful Poultry Management—By Morley A. Jull, Professor and Head of Poultry Dept., Univ. of Maryland. McGraw-Hill Book Co., Inc. $3.50.

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WELCOME TO THE FOREST

WHETHER it is a garden, a farm or a forest, any piece of land yielding crops may also yield repose and joy. So it is with the millions of acres of our national forests. Great numbers of our people have found simple refreshment on these great national properties. In future years millions of other forest guests will come. They may be sure of their welcome.

For the first white settlers of America the woods lay just beyond the fields or out the door. So it was with woods and other natural wild country all the way to the Pacific. Solitude in a land of marvelous beauty, with clean and shining rivers and an abundance of wildlife, was our natural pioneer heritage as we moved west.

Wherever modern men go civilization follows and crowds them. Often men are driven into unnatural pursuits and actions not good for the land. Much of unspoiled beauty and wonder still is ours, but there are also many places where men in ignorance, haste and covetousness have wronged and hurt their country. We see now that there is a new conquest to be undertaken, a new kind of pioneering to be done, a healing reconstruction from the ground up.

I sometimes think we need more than ever now to refresh our spirits and renew our aims in the solitude of beautiful natural places. There is a natural completeness about outdoor occupations which we who have been forced indoors and penned in cities lack and miss. A man in a desk chair with his feet on a rug and his eye on a wall or ceiling all day long is a man in some part cut off from real life and the eternal sources of renewal. There is something strangely restoring about work or play that is done with an eye to the sky and with foot to earth.

Henry A. Wallace